REPORT

OF

THE COMMITTEE ON SHORTFALL IN GENERATION DURING THIRD FIVE YEAR PLAN

NEW DELHI
APRIL 1967

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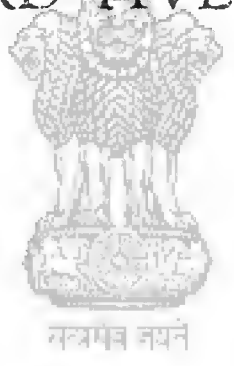

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APPENDICES

1. INTRODUCTION

1.1 Electricity being the principal pre-requisite for building up the 'Infra-structure' of a developing country, its development has been engaging the attention of the Government of India since the day of Independence. Great importance has been attached to power development in all the Five Year Plans.

1.2 During the first two Plan periods (April 1951—March 1961) the installed generating capacity in the country had increased from 2.3 million kW at the beginning of the First Plan to 5.677 million kW at the end of the Second Plan. The target for the Third Plan (April 1961—March 1966) was set at 12.695 million kW when the Plan was formulated in September, 1961. After the formulation of the Plan, additional schemes were also sanctioned to be taken up for implementation in the Third Five Year Plan. The actual achievement at the end of the Third Five Year Plan was 10.170 million kW. This indicated shortfall of 2.525 million kW.

1.3 There were several causes which had contributed to the shortfall. It was therefore, necessary to examine the reasons which had led to the shortfall and to devise measures so that the target for the Fourth Plan could be achieved in time. Accordingly, a Committee was set up by the Government of India in the Ministry of Irrigation & Power, *vide* No. 32(36)/66-EL.1, dated 11-8-66 annexed to this report as Appendix-1.

1.4 **The Committee comprised the following members :**

1. Shri K.P.S. Nair, Retired Vice-Chairman, CW&PC . . .	Chairman
2. Shri B.C. Gangopadhyay, Director (FE&P), Ministry of Irrigation & Power.	Member
3. Shri K.M. Chinnappa, General Manager, Tata Hydro-Electric Power Supply Co. Ltd.	Member
4. Shri H. R. Rao, Joint Director (Power), Planning Commission . .	Member
5. Shri P.M. Mane, Chief Engineer, Koyna	Member
6. Shri A.K. Ghose, Member (Thermal), CW&PC	Member-Secretary

1.5 **The terms of reference of the Committee were as follows :**

(*a*) To examine the reasons for delays in the implementation of thermal and hydro-electric projects in the Third Plan.

(*b*) To suggest measures—

(i) to accelerate work of planning, preparation of designs, construction of civil and ancillary works, erection, testing and commissioning of equipment, etc.

(ii) to ensure timely procurement of materials and equipment—simplification of procedures thereof.

(*c*) To indicate the extent of co-ordination required to be done by the Central agencies, such as CW&PC, Ministry of Irrigation and Power, etc.

1.6 The Committee was to submit its report by the end of November, 1966.

2—4 CW & PC/69

2. COLLECTION AND COMPILATION OF DATA

2.1 The Committee at its first meeting held on 31-8-66 reviewed the overall picture and drew up two comprehensive questionnaires, one in respect of thermal projects and the other in respect of hydro projects (*vide* appendices 3 & 4) for collecting the basic data in regard to the progress of the project in its various phases. The Committee prepared a representative list of 19 thermal projects aggregating 3.285 million kW and 14 hydro projects aggregating 2.236 million kW. The selection was so made as to cover the performance of all the State Electricity Boards and some private sector utilities. The list included not only the defaulting projects but also some projects which were completed more or less on schedule. The list of projects has been given in Appendix-5. The questionnaires were sent to Authorities of these projects in September, 1966 between 21-9-66 and 23-9-66. The Committee also arranged to take advantage of the services of the various regional offices of the CW&PC (Power Wing) to establish local contacts with the concerned Electricity Boards and other Electricity Undertakings for expediting the collection and despatch of the information called for. Two officers of CW&PC were also deputed to contact some of the project authorities for obtaining necessary data in this regard.

2.2 The response from the project authorities was on the average slow. Upto the end of November 1966, replies were received from 6 thermal and 4 hydro projects. The number increased to 13 thermal and 8 hydro projects by the end of January, 1967 and the final figures stood at 16 thermal and 10 hydro projects upto the 25th March, 1967. No replies were received from Madras and Maharashtra Electricity Boards. This would tend to indicate the lack of a suitable works progressing and co-ordination cell or section in many of the projects, of which more will be said later in the report.

2.3 The replies received were studied and various important and relevant data were tabulated and annexed to this report as per details given below :

(*i*) A descriptive summary of project data tabulated in Appendices 6 & 7.	(Appendix 2)
(*ii*) Compilation of data for thermal power stations . . .	(Appendix 6)
(*iii*) Procurement schedule for thermal power stations . . .	(Appendix 6A)
(*iv*) Compilation of data for hydro power stations	(Appendix 7)
(*v*) Procurement schedule for hydro power stations . . .	(Appendix 7A)
(*vi*) Commencement dates of various phases of thermal power stations.	(Appendix 8)
(*vii*) Comparative chart showing actual time required for various phases of thermal power stations.	(Appendix 9)
(*viii*) Commencement dates of various phases of hydro power stations .	(Appendix 10)
(*ix*) Comparative chart showing actual time required for various phases of hydro power stations.	(Appendix 11)
(*x*) Time taken for erection works in Third Plan for thermal power stations.	(Appendix 12)
(*xi*) Comparative chart showing time taken for procurement action, major civil works and erection.	(Appendix 13)

The assistance of CW&PC staff was availed of for work of the Committee.

2.4 It will be seen from the above that the various projects have progressed differently and different aspects have contributed to the delay in varying degrees. As such, the causes for the delay are not susceptible to a simple analysis. Even though there may be an apparent delay in any particular aspect of the project it would not necessarily mean that it causes a corresponding delay in the completion of the project. This is so because several steps have often to be initiated simultaneously and the end point is influenced by all of them. It is also seen that there are certain restrictions or restraints

which necessitate that certain conditions should be fulfilled before a particular aspect or operation can be commenced. In this context a PERT (Programme Evaluation & Reviewing Technique) network would be invaluable for fixation of priorities. It would appear that this or similar form of programming was not adopted by most projects during the Third Plan period.

2.5 Tabulations given in appendices 9 & 10 indicate the time taken for executing various phases or items of work. Broadly speaking, however, the total period can be divided into two parts, namely, (1) period from the date of submission of the project report to commencement of major civil works at site and (2) period from the date of commencement of major civil works to commissioning of the first unit. An analysis of the progress during each period would reveal the areas of delays.

2.6 There is a minimum limit for the second part (Actual Construction Period). Some variation arising out of type and size of plant, method of construction, etc., is normally to be expected. Delays in this part are often attributable to unforeseen difficulties or reasons or they may result as a consequence of delays in the first part where delays can be and have been substantial.

3. ANALYSIS OF PROJECT IMPLEMENTATION

3.1 In this section the Committee has analysed the performance of each project on the basis of the data furnished by the project authorities in response to the Committee's questionnaires. The various dates appearing hereinafter have been reproduced from the replies received from the project authorities.

3.2 Trombay Thermal Power Station Unit No. 4

3.2.1 The project report together with the loan application was submitted in December, 1961 and the unit was commissioned on 1-8-1965. It has taken 44 months for completion of the project from the date of submission of project report. In reviewing the progress of the project, this period is divided into two parts, *viz.*, (1) the period from submission of project report to the commencement of major civil works and (2) only from commencement of major civil works to completion of the project. The earlier period covers the planning, initiation of preliminary steps, design, land acquisition, site preparation and procurement aspects of the project and the later period covers the delivery of equipment and construction (civil, mechanical and electrical) aspects of the project. The project has taken 11 months for the pre-construction work and 33 months for construction.

3.2.2 The project being in the private sector, had certain advantages over public sector projects, in that, certain formalities which, of necessity had to be observed in case of public sector projects were not followed *e.g.*, clearance through Technical Advisory Committee, etc. Consulting Engineers had been appointed three months in advance (September, 1961) of submission of the project report and this had helped in advancing procurement action and collection of adequate technical details for starting construction at site. In effect, therefore, the pre-construction period can be considered as 14 months instead of 11 months as mentioned above.

3.2.3 As this is an extension project, the problems associated with site selection and land acquisition were not involved and the time required for such action was saved. Advance action taken for appointment of consultants enabled procurement of main equipment being finalised within 6 months of the submission of project report (within two months from the date of formal sanction) and the engineering co-ordination in the selection of auxiliaries could also be processed quickly resulting in all procurement action being finalised within 13 months thereafter.

3.2.4 The responsibility for procurement being vested with a single agency, quick decision and prompt procurement action could be taken. The period between the date of issue of tenders and the date of issue of letters of intent had varied between 3 to 8 months (average tendering time allowed was 4½ months).

3.2.5 There was no undue delay in the release of foreign exchange and issue of import licences. Most of the import licences were issued within three months from the date of application. The delivery period of main equipment was of the order of 15 to 18 months from the date of import licence.

3.2.6 Trombay being situated in the vicinity of Bombay, which is also the port of entry, no problems in rail transport were encountered. Clearing and transportation to site could be effected expeditiously. All these factors helped in early commencement of erection work and enabled the project authorities to follow a planned construction schedule.

3.2.7 For actual construction the project has taken 33 months; from the construction schedule, it is seen that boiler erection has taken the longest time, about 21 months and the civil works for it have taken about 11 months as against 22 months and 14 months respectively targetted for these two items. A properly drawn up schedule of construction programme made it possible to co-ordinate erection of auxiliaries, although there might have been some delays in the delivery of a few auxiliaries; this did not prove critical.

3.2.8 It is obvious that in this project, various phases of the work have been carried out expeditiously. Of particular interest is the short time taken to reach the construction stage. Once this stage is reached, the progress of work would follow a certain pattern; often predetermined which would not, in major details, vary appreciably from project to project but for unforeseen difficulties. The performance of this project in actual construction can be considered typical and is likely to be repeated, with minor variations, in other similar projects too, whether in private or public sector but there may be difference during the pre-construction period.

3.3 Satpura Thermal Power Station

3.3.1 This is one of the projects for which some advance action for procurement of generating units and several items of other major thermal equipment under a "Bulk Purchase" scheme, was initiated in 1961. It would be correct to assume that it was only after the units were allotted to several projects, that the preliminary work in connection with the project report could be undertaken. When the Third Plan programme was worked out in September, 1961, the project was apparently in the 'Investigation' stage. The power station was tied to a local mining programme in a hilly terrain which was not easily accessible.

3.3.2 The project report was submitted in January, 1962, major civil works at site started in January, 1964 and the first unit is expected to be commissioned in June/July 1967. This project implementation time reckoning from the date of submission of project report works out to 67/68 months out of which 24 months are for pre-construction period and about 44 months for erection. According to the original programme, the first two units were to be commissioned in 1965/66.

3.3.3 Authorisation for proceeding with the implementation of the project was given in September, 1962 and this appeared to have caused a delayed start, which reflected in extending the project implementation time. It was largely due to inter-State aspects to be considered before authorisation could be issued. This was followed by land acquisition in December, 1962 and appointment of consulting engineers on 29-12-62. Between land acquisition and site preparation work undertaken in December, 1963, the Project Authorities had to construct about 12 miles of access roads, suitable for heavy traffic and a railway siding together with an unloading bay at a suitable point about a mile away from the nearest railway station and 11 miles from power station site. In addition, the plot plan with all essential details had to be finalised.

3.3.4 On the procurement side, the tenders for the balance of the equipment were issued between July '63 and November '63. The foreign exchange for such procurement was tied in May '63 to AID Loan No. 388. In consequence procurement had to be arranged through D.G.S. & D.

3.3.5 The period between the issue of tenders and issue of letters of intent has varied between six to fifteen months. In most cases, foreign exchange was released within 1½ to 2½ months from the date of application. This period was 6/7 months in case of the contracts for supply and erection of piping and erection of Turbo-generator unit. Although some variation in these respects would not necessarily affect the end point, procedural delays in case of critical items could postpone the commissioning date. The tenders for piping were invited in May, 1963 and the letter of intent was issued about nine months later in February, 1964. The release of foreign exchange took about six months and the letter of credit was opened on 8-9-65. Furthermore, the suppliers could not complete delivery as scheduled due to reorganisation in overseas factory units and there was about seven months' delay in release of foreign exchange for the Erection Contract. This item has thus become the limiting factor in spite of the fact that there have been delays in other items too.

3.3.6 The erection of Boiler started in April, 1964. Although civil works were ready in October, 1965, the erection of the turbo generator unit could not be taken in hand before July, 1966. Because of transport problems, the receipt at site of the oversized packages of the power house gantry crane was delayed with the result the crane was not erected ready before January, 1966. This was the earliest when turbo-generator erection could start but there was further delay of about 5 months due to late arrival of the manufacturer's Supervising Engineer.

3.3.7 The various factors contributing to the delay are as follows :

(1) delay in issuing authorisation to proceed with project implementation;
(2) delay in delivery of pipe work;
(3) delay in erection of the gantry crane due to difficulty in moving oversized packages;
(4) late arrival of the erection supervisor.

3.4 Korba Thermal Power Station.

3.4.1 The project report was submitted in April, 1960 and the project was sanctioned in April, 1961. The major civil works at site were taken up in November, 1962 and the first unit was commissioned in September, 1966. The total time dating from submission of project report works out to 77 months of which the pre-construction period is 31 months and construction period 46 months. According to original schedule, the first unit was due to be commissioned in 64/65 and 2 more units in 65/66.

3.4.2 The foreign exchange was tied up with U.S.S.R. credit. According to standard U.S.S.R. practice, the responsibility for design and engineering was entrusted to suppliers. In spite of the fact that complete work relating to design, engineering and supply of equipment was in the hands of one agency and normal procedures for procurement were not necessary, the completion of the project was delayed.

3.4.3 The detailed project report submitted by U.S.S.R. was received in March, 1962. It was accepted in April, 1962. The contract for complete equipment was signed in August, 1962 and Import Licence was issued in October, 1962. There was, thus, no delay in procurement action of main power plant equipment.

3.4.4 The civil construction drawings for the first two boilers and turbo-generators were supplied in November/December, 1962. All other civil drawings were furnished progressively and completed by March, 1964 for the first two units. The drawings for the 3rd & 4th units were also furnished within the 1st quarter of 1964.

3.4.5 The commencement of boiler erection was delayed until October, 1964 due to the fact that the tower crane required for boiler erection was not included in the scope of supply envisaged in the project report. This omission was detected only when the project report was received and inspite of best efforts, earlier delivery was not possible. According to Soviet method of construction, some work for boiler erection was done in what is known as 'pre-assembly yard'. This part of the boiler erection could not also start as necessary drawings were not supplied until February, 1964. These delays have affected the commissioning dates considerably.

3.4.6 The erection of turbo-generator could be taken up in January, 1965 and this delayed start was due to the fact that Soviet Specialists to supervise the turbo-generator foundation construction did not arrive till July , 1964. The erection time of turbo-generator was 19 months which was rather unsual and the delay was attributable to labour strike, flood at the construction site in 1965. The turbo-generator erection thus became the limiting factor for the 1st unit.

3.4.7 The installation of gates in Hans Deo barrage being constructed by the Irrigation Department for cooling water supply was delayed due to (i) Non-receipt of the raw materials for the gates in time (ii) Delayed delivery of fabricated gates. Alternative arrangements for the 1st two units have been made but the commissioning of third unit is affected on this account.

3.4.8 The various factors contributing to the delay are as follows :

1. Delayed procurement of tower crane.
2. Late arrival of Soviet Specialists.
3. Labour strikes on two occasions.
4. Emergency in October, 1962.
5. Shortage of welding rods and other construction material.
6. Delay in start of mechanical erection for coal handling system.

3.5 Neyveli Thermal Power Station

3.5.1 This is an extension project of 150 MW to the existing 250 MW (5 × 50 MW) project covered by Soviet Loan. Before the 1st stage was fully commissioned the extension scheme was thought of and as there was no change in foreign exchange source it was assumed that the 50 MW unit of the extension would be identical to the 1st stage units and accordingly the facilities for the 50 MW extension were provided under the 1st stage as a continuous process. The preliminary project report was submitted in December, 1961 but on the basis of preliminary works carried out, the project was included for implementation in the Third Plan (50 MW unit in 1964/65 and 100 MW unit in 1965/66).

3.5.2 The detailed project report was submitted by U.S.S.R. in October, 1963 and the formal contract was signed in March, 1964 but clearance was given to U.S.S.R. to proceed with the manufacture earlier for complete delivery of the sixth unit (1 × 50 MW) by the 3rd quarter of 1964 and the seventh unit (1 × 100 MW) by the 4th quarter of 1965.

3.5.3 Because of the advance action taken for the sixth unit even before the formal accord to the contract, the work pertaining to the sixth unit progressed according to the schedule except that because of the increased level of sub-soil water in the extension area, there was the need to redesign the civil works. This caused a delay of about 4 months and the sixth unit (50 MW) was commissioned in August, 1965.

3.5.4 The design and engineering for the seventh unit being of different size (100 MW) had to be somewhat different from that of the earlier 50 MW units.

3.5.5 There had been some delay in the receipt of drawings which reflected in a delayed start of the seventh unit. The delivery of some of the critical items was delayed by 6 to 7 months. There was also some delay as some of the equipments pertaining to Neyveli were despatched to Obra project. The cumulative result of such delays have postponed the commissioning of the unit. It has been ascertained that seventh unit is fully erected and is ready to go in for commercial operation in April, 1967.

3.5.6 The time taken for pre-construction period dating from the date of submission of project report is 33 months and for construction period from the date of start of major civil works is 31 months.

3.5.7 The delays have been due to the following :

1. Delay in receipt of drawings.
2. Wrong delivery of some equipment of Neyveli to Obra.
3. Delay in delivery of some of the critical items.

3.6 Kalakot Thermal Power Station

3.6.1 The project report was submitted in June, 1961 for four units of 5 MW each and the project was sanctioned in December, 1961. It was subsequently revised to installation of 3 units of 7·5 MW each and revised contract was signed in January, 1963. Third Plan target covered 10 MW to be installed in 64/65 i.e., 2 units of 5 MW out of the 4 units envisaged in original project report. This major change in the scope of work altered in effect the original construction schedule and in fact had resulted in delaying the starting date although some preliminary works were started and foreign exchange tied up in 1962.

3.6.2 The design and engineering of the project was entrusted to suppliers (Energo Invest) who apparently started work after the revised contract was signed in January, 1963. Major civil works were started in December, 1963. Because of a controversy raised in 1964 regarding the availability of coal, the Government of Jammu & Kashmir ordered stoppage of all construction work. Delivery of major equipment such as boiler and turbo-generator etc., started between May and July 1964 but under the same Government orders the materials were stored at Pathankot. No indication has been given by the Project Authority as to the time when the Government embargo was lifted, but from the details furnished, it was apparent that civil works were resumed some time in 1964 and completed in December, 1965. Tenders for erection of the plant and machinery were finalised in the

middle of 1965, by which time civil works had sufficiently advanced for mechanical erection of plant and equipment. The erection contractor started work in June, 1965 but due to Pakistan's aggression they left the site and work could not be resumed until first quarter of 1966. Because of the unsatisfactory performance of erection contractors, the contract had to be terminated with some effort and departmental work had to be arranged.

3.6.3 All the heavy equipments upto this time were lying at Pathankot. Because of limitation in the carrying capacity of intervening bridge near Aknur and difficult access roads over the hills under the control of the army, the transfer of heavy equipment become a problem and caused considerable delay. Some consignment of essential equipment was impounded at Karachi and has not yet been released. Arrangements for replacements are still in progress. The suppliers also delayed delivery of several items of equipment.

3.6.4 Taking all these into consideration, the first unit is not likely to be commissioned before March, 1968.

3.6.5 Various factors contributing to delay in commissioning the plant are :

(1) Major change in the scope of work;

(2) Temporary stoppage of work as ordered by the Government of Jammu & Kashmir on account of controversy regarding availability of coal;

(3) Delay in receipt of equipment from supplier;

(4) Restrictions regarding transport of heavy equipment over bridge across river Chenab and difficult access road over the hills, imposed by army authorities;

(5) Delay caused by Pakistan's aggression and infiltration activities in August/September 1965;

(6) Delay due to inability of erection contractor to organise the work after the hostilities.

Some of these factors were extraordinary and were applicable to this particular project only.

3.7 Tura Thermal Station (Garo Hills)

3.7.1 At the time of preparing the Third Plan Programme in 1961 it was thought of that there should be a small power station in Nongwalbibra coal-fields in Assam. The tying up of foreign exchange was indicated in January, 1962 and the formal approval of Planning Commission was obtained in February, 1962. This was the beginning of this project and even the project report followed later.

3.7.2 The location being in remote and difficult terrain the progress during the initial stage was slow as adequate data was not available. Before any preliminary work at site could be started, the project authorities had to construct 87 miles of access road for transporting the earth moving and construction machinery. The procurement of construction machinery was initiated in December, 1961 and the letter of intent was issued in June, 1962. The equipment was delivered in March, 1964 and this was the time when the preliminary works could be taken up.

3.7.3 No consulting engineer was appointed. Tenders for various equipments were issued between January, 1962 and July, 1966. This would indicate the deficiency in planning and design organisation under the project. The major civil works started in December, 1964.

3.7.4 On the equipment side, most of the equipment excepting the power station piping has been ordered. Import licences as necessary have also been issued. No detailed schedule appears to have been made by the Project Authorities but on the basis of the delivery it is anticipated that one unit may be commissioned in the middle of 1968. On the basis of this intimated data, the project completion has taken 76 months from the date of sanction of project and 42 months from the date of start of major civil works.

3.7.5 The various factors contributing to the delay are as follows :

1. Difficult terrain and lack of easy access. A 87 mile long access road had to be constructed for the transport of equipment.

2. Delay in delivery of construction machinery resulting in delay in start of preliminary civil works.
3. Deficiency in proper planning and designing organisation.
4. Delayed delivery of piping.

3.8 Chandrapura Thermal Power Station (Stage—I)

3.8.1 When the first unit of Chandrapura was sanctioned in April, 1958 on priority basis to meet the anticipated railway demand, the site was not finally selected and adequate project data was not available. Some rupee expenditure was authorised in the year 1958/59 which enabled the Project Authorities to proceed with the land acquisition and other minor preliminary civil works. It was originally intended that the unit will be financed by EXIM Bank Loan. This was, however, altered and the project was tied up with D.L.F. Loan authorised in June, 1960. In the meantime, the second unit was sanctioned in December, 1959.

3.8.2 Consultants were appointed in September, 1958; but the scope of their services was restricted with a view to building up competancy within the organisation in this field. The additional burden of building up of the organisation simultaneously with the implementation of the project had its effect on the progress of the project. Tenders for boiler and turbine were issued in January, 1959.

3.8.3 As sufficient project data was not available considerable preliminary work including investigation had to be carried out between January, 1959 and end of 1961. Major civil works for the power station started in March, 1962. One factor contributing to the delayed start of civil works was the late ordering of boiler plant which was delayed by more than a year. On the procurement side the period between issue of specification and release of foreign exchange had varied between 10 and 12 months. This had an important bearing on the delivery of equipment. The procurement period had also extended over three years which was longer than usual. This suggests that the design and engineering work was slow.

3.8.4 The first unit was commissioned in October, 1964 which works out to 31 months from the commencement of major civil works at site. There was considerable delay in delivery of turbine house crane affecting the commencement of turbine erection. This, however, did not materially affect the total construction period except by a couple of months.

3.8.5 The second unit was commissioned in May, 1965. This reflected in some delay as this unit should have been completed within 2/3 months from the date of commissioning the first unit. This delay took place as several replacement parts for the boiler and turbine were not received in time and the boiler feed pump motors failed one after another during trial operation. Commissioning of second unit had to await rectification of boiler feed pump motors.

3.8.6 The major factors contributing to delay can be summarised as follows :

1. Lack of adequate project data, at the time of sanction.
2. Delay in foreign exchange tie-up.
3. Delay in finalising tender for boilers.
4. Delay in delivery of Turbine House Crane.
5. Delay in getting replacement parts in case of several units.

3.9 Durgapur Projects Power Station

3.9.1 The project report for the installation of 2 × 75 MW turbo-generator units as an extension to the existing power station of M/s Durgapur Projects was submitted sometime in the middle of 1959. The first unit was commissioned in April, 1964 and the second one in July, 1964. The project implementation period reckoning from the date of submission of project report worked out to 58 months out of which 26 months constituted the pre-construction period and balance of 32 months was construction period. As soon as some indication was received that the project would be sanctioned, preparation of comprehensive specification for complete equipment was taken in hand departmentally. It was followed by appointment of consultants in November, 1959. Global tenders were issued in December, 1959. The formal sanction to the project was issued in January, 1960.

3.9.2 The foreign exchange tie-up was indicated in June, 1960 and ordering of major imported equipment was completed in September, 1960. The residual indigenous items were ordered progressively. The import licences were issued between January and April, 1961.

3.9.3 Preliminary civil works for site preparation and access road etc. were not necessary. Advance action for procurement of steel, cement etc. was taken between the fourth quarter of 1959 and first quarter of 1960. Major civil works for power plant started in August, 1961.

3.9.4 This is one of the projects in which the complementary actions were mapped out in advance and in sufficient details and the work progressed more or less according to schedule although some delay had occurred in some of the operations. The commencement of major civil works in the boiler area was delayed some 3 months due to some changes made in the boiler design (provision of an electro-static precipitator and platforms and galleries being made independent of other building structures). This did not affect the commissioning date. On the other hand, at an intermediate stage of civil construction there was difficulty in obtaining railway priority for movement of aggregate of designed quality from Pakur (in Bihar) and delivery of some special steel sections and plates was delayed with the result the Coal Bunkers and the main control room could not be completed until the third quarter of 1963. The residual works dependent on these civil works were executed expeditiously and the first unit was commissioned in April, 1964 reflecting in delay of about 4 months. The second unit was commissioned in July, 1964. It may be stated that the Third Plan target was not affected.

3.10 Durgapur Thermal Power Station (D.V.C.)

3.10.1 The project report for installation of one unit of 140 MW as an extension to the existing power station at Durgapur was submitted in December, 1960. The unit was commissioned in December, 1965 and the toral period worked out to 72 months of which 40 months were taken to commence major civil works at site and another 32 months to construct and commission the unit. According to original schedule the unit was due for commissioning in 1965/66.

3.10.2 Advance action was authorised and foreign exchange tie-up indicated in May, 1961. Although an extension project, it took the Project Authorities 39 months from this time to commence major civil works at site. Once this was started, field construction progressed more or less according to normal timing. It can be construed that the project has been delayed during the pre-construction period.

3.10.3 The tender specifications for boiler and turbo-generator were prepared departmentally and issued in August, 1961. The tendering time allowed was six months. The tender scrutiny and purchase recommendations took another six months and were not ready until August, 1962. In the meantime, consultants for limited services (Design guidance and review of design to be made departmentally) were appointed in April, 1962. It would appear that the delayed appointment of consultants reflected in delay in finalising the purchase recommendations. The application for foreign exchange release was submitted in September, 1962 and foreign exchange was released in January, 1963. This was followed by letter of intent issued in January/February, 1963.

3.10.4 The boiler equipment details for starting civil design were furnished in May, 1963. The working drawings were prepared departmentally and reviewed by the consultant. This process took sometime and the release of the first lot of construction drawings was delayed by 4/5 months. The first consignment of reinforcement and structural steel was not received before April, 1964 although ordered in August '62 with the result the major civil works could be started only in April, 1964.

3.10.5 On the procurement side, ordering of balancing items took longer time than usual. The last major tender for control and instrumentation was issued 30 months after the boiler tender and the order was placed after another 10 months in December, 1964.

3.10.6 The overall construction period was not largely affected although several operations in field construction got somewhat delayed. The turbo-gernerator was delivered 3 months later than the scheduled date but this did not influence the end point. The limiting factor was the control and instrumentation owing mainly to late ordering. But for some delay in shipment of this item, the construction period could have been reduced from 32 to 30 months.

3.10.7 The completion of the project was pushed back due to delays during pre-construction stage and the principal contributing factors are :

1. Delayed appointment of consultants.
2. Procedural delays in procurement.
3. Delays in preparation of construction drawings.
4. Delays in receipt of steel.
5. Slight delay in shipment of turbo-generator and control and instrumentation equipment.

3.11 Indraprastha Thermal Station

3.11.1 This is one of the projects planned for execution with bulk purchase equipment for which procurement action was initiated in 1961. A preliminary project report was submitted in May, 1961 and some authorisation to proceed with some of the preliminaries was indicated in September, 1962. As a first step, a control board was created in the same month. There was no suitable organisation to deal with the project work and in consequence there was hardly any progress during this stage. Foreign exchange was not tied up until March, 1963 and this was one reason why the project was practically at standstill. Formal sanction of the Planning Commission was accorded in June, 1963 and this was followed by appointment of consulting engineer in July, 1963.

3.11.2 Although some of the thermal equipment was ordered under the bulk purchase schemes and supply of indigenous boilers was negotiated, a considerable amount of co-ordination and procurement work was involved, and the lack of a suitable organisation during this stage reflected adversely in project implementation. Such was the condition of the project upto the beginning of 1964. The early construction schedule prepared in 1961 became unrealistic at this stage. The Chief Engineer for this project was appointed in March, 1964 and the procurement action for the balance of items was processed progressively. As the consultants did not have a local organisation for engineering and design and all work in this connection was done in U.S.A. there was some delay in finalising the orders. Added to this were the procedural delays due to formalities involved in processing through D.G.S.&D. Piling in power station area started in June, 1964 marked the beginning of field construction. According to present programme the first unit will be commissioned in April, 1967 and the field construction period works out to 34 months.

3.11.3 The procedural delays in procurement of balancing items reflected in substantial postponement of delivery of equipment which in turn affected the construction schedule. In case of several vital and critical items the opening of letter of credit was delayed by about 6 to 7 months and in consequence materials were not received at site in time to follow a predetermined construction schedule.

3.11.4 The principal factors contributing to the postponement of commissioning of the unit from what was assumed earlier are :

1. Lack of a suitable organisation to deal with project work during the early stages.
2. Delay in foreign exchange tie-up.
3. Lack of local organisation of consulting engineers to deal with design and engineering work.
4. Procedural delay in processing procurement through D.G.S.&D.

3.12 Ramagundam Thermal Station 'B'

3.12.1 The project report for this thermal station was submitted on 23-1-1961 and as per this project report the target date for commissioning the unit was 1963/64. In the Third Plan target it was indicated that a 60 MW unit will be commissioned in 1964/65. Approval of the Planning Commission was communicated on 15-4-1961. However, the AID Loan agreement was concluded on 21-5-1963. Thus there was a lapse of 25 months between the formal sanction and foreign exchange tie-up. The consultant was appointed in July, 1963. The project was in progress at the end of March, 1967 and unit was expected to be commissioned towards the end of 1968. Thus the project implementation time is likely to be 95 months. This incidentally is the longest time for project implementation of all the thermal projects considered. There was a delay of 6 months in selection

of site. Major civil works in the form of turbo-generator foundation concreting work were taken up in October, 1965; as such the pre-construction period works out to 57 months and construction period is likely to be 38 months.

3.12.2 However, the services of the consulting engineers were of an advisory nature and it was intended that detailed engineering and design would be done by the project authorities. Apparently about 24 months delay was experienced in building up the design organisation to be in a position to handle the work. The Consulting Engineers did not have a proper organisation at site with the result the design approval had to come from U.S.A. The procedure reflected in considerable delays.

3.12.3 Part of the major equipment like turbo-generator and some of the imported auxiliaries were procured in advance under the scheme of "Bulk purchase". The balance of equipments was procured by prompt authorisation in a piecemeal order and action regarding the supply of H.P. piping and instrumentation were not yet completed (Ist quarter of 1967). The time between issue of tenders and issue of letters of intent was 15 months and 20 months in respect of boiler and condenser. In other cases, corresponding period was of the order of 8 to 10 months. The delay in procurement of these two items also caused delay in procurement of other items as they are interdependent.

3.12.4 The implementation of the project was also tied up with a proposal for a 200 MW thermal station offered by Dr. J. Dharma Teja, which was later dropped. This presumably upset the project schedule resulting in delay.

3.12.5 Construction of the project was still in the early stage and hence it is difficult to predict the course of events. There was delay in receipt of equipment drawings for civil design. There was delay in the despatch and receipt of structural steel work. The delivery and erection of pipe work and control instrumentation would be the critical items as the contract was not yet finalised.

3.12.6 The delay in this project may be summed up as follows :

1. 25 months delay in foreign exchange tie-up which resulted in delay in the appointment of consultant.
2. 5 months delay in site selection.
3. Delay in procurement action.
4. Delay in receipt of equipment drawings for civil design.
5. Stoppage of work by consultants and the resultant delay in ordering some viral equipment.

3.13 Obra (Singrauli) Thermal Power Station

3.13.1 This project covers the installation of 5 × 50 MW turbo-generators. In the original Third Plan scheme prepared by Planning Commission in September, 1961 it was proposed to instal 2 units in 1964/65; two more units in 1965/66 and the fifth unit in Fourth Plan.

3.13.2 The decision to set up this station under U.S.S.R. credit was taken sometime in middle of 1959 and foreign exchange source was communicated in January, 1960. Detailed project report prepared by Soviet Engineers was received in January, 1963. This caused the initial set back. As per the construction schedule based on this project report five units of this station were to be commissioned between December, 1965 and December, 1966 at an interval of 3 months.

3.13.3 The Soviet Engineers were responsible for complete design and engineering. Authorisation for rupee expenditure was communicated in March, 1960. Land acquisition was completed between August, 1961 and December, 1961 following site selection in September/November 1960. However, preliminary civil works like levelling and dressing of the site were started in July, 1963. Presumably no action was taken pending the receipt of detailed project report from U.S.S.R. Major civil works were taken up in May, 1964.

3.13.4 The project was in progress at the end of March, 1967 and the first unit was expected to be commissioned in April, 1967. Starting from the date of commencement of civil works the construction period would work out to 35 months. Memorandum of instructions giving the broad outline of the project was furnished by the U.P. Electricity Board to Soviet Engineers in February, 1961. It would be more appropriate to consider the pre-construction period as 39 months and project implementation period 74 months. The major delay is due to late receipt of detailed project report which was to be furnished by U.S.S.R. and without which no concrete steps could have been taken.

3.13.5 There was a delay of about one month in the receipt of drawings. Some of the construction materials were also delayed. Mechanical erection was started about 6 to 9 months later than targetted although no specific reason was apparent.

3.13.6 Major delays in this project may be summed up as follows :

1. There was delay in taking up preliminary civil works as presumably no action was taken pending the receipt of the detailed project report.
2. Delay in receipt of drawings and construction equipment. This affected the commencement of mechanical erection.

3.14 Bandel Thermal Power Station

3.14.1 In the original Third Plan schemes prepared in September, 1961 it was proposed to install 2 units of 75 MW in 1964/65 and two more identical units in 1965/66. Project report was submitted in July, 1960 as per which it was envisaged that the four units would be commissioned between January '66 and June '66. The size of the units was subsequently changed from 75 to 82·5 MW. Approval of Planning Commission was conveyed in December, 1960. Foreign exchange was formally communicated in May, 1962 and this is due mainly to some procedural delays but since some definite information about foreign exchange source was available earlier it enabled the project authorities to proceed.

3.14.2 Consulting Engineers were appointed in August, 1960. Tenders for the equipment were issued in March, 1961. This was made possible by taking advance action in appointing Consulting Engineers and initiating procurement action. Letters of intent were issued in six months. Issue of import licence was delayed in case of power station switchgear, power and control cables and water treatment plant in which cases the period varied between 7 and 10 months. In other cases, import licence was issued within 3 months.

3.14.3 Land acquisition was commenced in September, 1961. Preliminary work on access roads and discharge canal work started in May, 1962. Major civil works were taken up in June, 1962. The pre-construction period reckoning from date of project report worked out to 23 months and the construction period to 40 months. This latter period would tend to indicate some delay in field construction. The project authorities lost about 8 months due to unforeseen difficulties encountered in connection with circulating water channel. The labour strikes accounted for about a month's delay. In spite of such delays three units were commissioned within the Third Plan period. One of the reasons for delaying the fourth unit was that some vital components pertaining to the fourth unit were transferred to other units to make good the shortages and transit damages. The replacements were delayed.

3.14.4 This is one of the projects completed with speed and alertness. Early appointment of consultants ensured timely co-ordination and methodical scheduling of various complementary actions. Boiler erection was started in May, 1963 and turbine erection in December, 1963. The first unit was commissioned in October, 1965 and the other two units by March, 1966.

3.14.5 The project experienced following difficulties and delays in its execution :

1. Delay of 10 months due to port strike in U.S.A.
2. Delay of 6 months due to non-availability of import licence.
3. Delay of one month due to labour strike of contractor.
4. Delay of 10 months due to unprecedented blow out in the intake of C.W. System.

3.15 Dhuvaran Thermal Station

3.15.1 The original project report for setting up a thermal station of capacity 150 MW was submitted in November, 1959. Formal approval was given in February, 1960. The scope of the project was subsequently changed to 254 MW. This change was formally approved in October, 1960, but there was no delay on this account. In the target for Third Five Year Plan it was envisaged that one set of 60 MW would be commissioned in 1963/64, two sets in 1964/65 and the fourth set in 1965/66. Foreign exchange tie-up was communicated in July, 1960. Major civil works were taken up in July, 1961 and all the four units were commissioned between January, 1965 and August, 1965 in quick succession. Thus, the project has taken 62 months (68 months for all the four sets) for implementation, out of which 20 months was pre-construction period and 42 months were for construction.

3.15.2 Land acquisition proceedings started immediately on receipt of formal approval to the project. The comprehensive tender for all major equipment was prepared by erstwhile State Electricity Board (Bombay) and issued in May, 1960. Procurement and construction contract was awarded on a "Turnkey" basis and the engineering work proceeded. The formal release of foreign exchange had to await appointment of consultant which was done in August, 1961. This delay, however, did not have any material effect on the progress of the project.

3.15.3 The major civil works were commenced in July, 1961. The mechanical erection of equipment, however, was taken up in December, 1962. The delay in starting erection work is attributed to delay of six months in release of foreign exchange for erection insurance. This delay finally affected the commissioning date. Minor holdups in shipment or short stoppages of work due to labour strike were not material but some major difficulty was experienced in maintaining dredged channel between low water stream and pump house. Recirculation scheme had to be introduced for condenser. Delay of six months for cooling water was experienced in commencing the plant due to the above.

3.15.4 Causes contributing to major delay in implementation of Dhuvaran Project can be summed up as follows :

1. Delay of six months in the release of foreign exchange for erection insurance which in turn delayed commencement of mechanical erection.
2. Difficulty experienced in maintaining a dredged channel between low water stream and pump house which was solved by resorting to recirculation system.

3.16 Talcher Thermal Scheme

3.16.1 The project report was submitted on 30-4-60 and the approval of the Planning Commission was communicated on 4-1-61. In the targets for the Third Plan, it was intended that one set of 60 MW would be commissioned in 1964/65 and two sets in 1965/66 giving a total of 180 MW in the Third Plan. Foreign exchange tie-up with D.L.F. Loan was communicated on 29-8-61. At the end of March 1967, the project was in progress and the first unit was expected to be commissioned in August, 1967. Thus the project implementation time works out to be 88 months of which 43 months were pre-construction period and the construction period is likely to be 45 months.

3.16.2 Consulting engineers were appointed on 9-10-61. This is also one of the projects envisaged under bulk purchase scheme and turbo-generators and some of the major auxiliaries were procured under this scheme. Procurement action for the balance of equipments was taken on the advice of the consulting engineers. Letters of intent for most of the equipment were issued before December, 1964 which indicates that the procurement action for balancing equipment was spread over a period of nearly 2 years. There appears to have been significant delay between the dates of finalising orders and dates of issue of letters of intent. In most cases this has taken more than 3 months while in case of boiler it has been as much as 8 months.

3.16.3 Selection of site was done in September, 1960 and land acquisition proceedings were commenced in April, 1961. The major civil works were taken up in November, 1963. The delay in pre-construction period appears to be due to late receipt of data from boiler suppliers as the letter of intent for boiler was issued only in February, 1963.

3.16.4 The delay in procurement action has also caused delay in the construction phase of the project. The equipments ordered were not delivered in time. One consignment of control value was off-loaded in Karachi. Three months delay was experienced due to labour strike of contractor's men.

3.16.5 Major causes for delay may be summarised as follows :

1. Delay in procurement action;
2. Delay in delivery of equipment;
3. Impounding of equipment in Pakistan;
4. Labour strike of contractor's men.

3.17 Patratu Thermal Power Station

3.17.1 The project report for installing 2 Nos. of 50 MW sets at Patratu was submitted on 7-4-1961. Approval of Planning Commission was communicated earlier on 11-1-1960. The project report was subsequently revised on 22-1-1962 to include 5 × 50 MW sets. In the targets for the Third Five Year Plan it was envisaged that one set of 50 MW would be commissioned in 1964/65, followed by three sets in 1965/66 giving a total of 200 MW in Third Plan. The project report was further revised according to which 4 sets of 50 MW and 2 sets of 100 MW were to be installed at Patratu giving a total installed capacity of 400 MW. The first unit was commissioned in June, 1966.

3.17.2 The project report was prepared on the basis of plant and equipment being supplied from U.S.S.R. Although the availability of foreign exchange from this source was confirmed much later, the salient features of the project were finalised in consultation with the Soviet Specialists in March, 1962. Contract for supply of equipment was signed in September, 1962.

3.17.3 Land acquisition which was initiated in 1958 was done in phases and completed in 1963. Levelling and dressing were commenced in December, 1961 and major civil works were taken up in March, 1963. Mechanical erection was commenced in May, 1964.

3.17.4 Although advance action was taken in the implementation of this project, no significant progress could be made till the source of foreign exchange was confirmed. Major changes in the scope of work have also contributed to the delay. Civil works could not be started till the receipt of project drawings from the Soviet Engineers and delay on this account affected the progress of the project. Delay in the receipt of the tower crane also caused a hold up in the project implementation. Acid cleaning of boiler was held up for want of cleaning equipment and this had reflected in the postponing of the commissioning date.

3.17.5 Thus, the major causes of delay in this project are :

1. Major changes in the scope of the project.
2. Delay in confirmation of foreign exchange source.
3. Delay in the receipt of the project drawings.
4. Delay in supply of tower crane.
5. Hold up in acid cleaning of boiler.

3.18 Atomic Power Station—Tarapore

3.18.1 Following a decision made at the highest level of the Government of India, to proceed with the construction of an Atomic Power Station, a preliminary global tender for a complete power station was issued in October, 1960 (17-10-1960). At that stage no detailed project report was available and the tender documents were prepared on the basis of performance specification submitted by a project team. Apparently, it was assumed that necessary project information would be available when tenders were received.

3.18.2 Seven tenders (one each from Canada and France, two from the U.K. and three from U.S.A.) were received in August, 1961 (31-8-1961). This was followed by prolonged discussions and/or negotiations, technical or otherwise for (i) giving a shape to the Project, (ii) deciding the type and size of the Reactor, and (iii) for deciding the source of supply and arranging for funds, in foreign currency. The project was formally sanctioned in September, 1962 and in the same month a letter of intent was issued to Messrs. General Electric of U.S.A. The project report together with the loan application was submitted to USAID in November, 1962 (27-11-1962). The subsequent processes included a Bilateral Agreement with U.S. Atomic Energy Commission which was reached in August, 1963 (8-8-1963) and the AID loan agreement was signed in December, 1963 (7-12-1963). This enabled the Project Authorities to start negotiations with Messrs. General Electric for finalising the contract agreement which was to be approved by USAID and U.S. Atomic Energy Commission. The contract agreement was signed in May, 1964 (5-10-1964). According to the programme of construction prepared by the Project Authorities, the first generating unit would be commissioned in June, 1968. The construction work has been reportedly progressing according to schedule.

3.18.3 It becomes obvious that the inclusion of this Project in the Third Plan target was not realistic and to that extent there was no shortfall.

3.19 Sharavathy Hydro Electric Project

3.19.1 This is a high head, single purpose, single state hydro electric project envisaging the installation of 2 × 89. 1 MW. This is a continuing scheme from the Second Plan yielding result in the Third Plan. In the original Third Plan Scheme it was envisaged that one unit each will be installed in 1962/63 and 1963/64. The First unit has been commissioned in January, 1965 and the second unit in April, 1965.

3.19.2 The investigations for the project were started in 1952 and a project report was submitted for installation of a hydro station on 25-10-54. The unit size contemplated in the project report was 71 MW each. The administrative sanction for starting the project work was accorded after 20 months in June, 1956 from the date of submission of project report.

3.19.3 Presumably on being indicated that the project is coming through, the land acquisition proceedings were initiated and simultaneously the preliminary civil works (access roads, colonies, etc.) were started in early 1956 *i.e.* about 3 months earlier than the formal sanction for starting project work. The preliminary civil works could not start earlier as the accord of formal sanction was delayed. No consultant was appointed and the design and engineering work was done departmentally.

3.19.4 In 1958 the following major changes in the scope of the project was made :

1. Unit capacity changed from 71 MW to 89. 1 MW.
2. Construction of main & subsidiary dams changed from composite type to full masonry type.
3. Due to non-availability of suitable foundation for masonry dam a portion of the main dam on the right bank was changed to earth dam.
4. Capacity of water conductor system was increased.
5. Surge tanks were proposed instead of forebay.
6. Height of dam was increased by 2 feet to accommodate revised peak discharge.
7. The design of the water conductor system was changed to R.C.C. duct covered and open instead of an open channel with cement concrete lining on rough stone revetment.

3.19.5 The major civil works for the dam was taken up in 1958 *i.e.*, 27 months later from the start of preliminary work. It, however, appears that the work could not proceed with the desirable tempo as the list of construction machinery to be imported including shovels, excavators, bulldozers, dumpers, scrapers, etc., was finalised in 1958. The majority of the equipments arrived at site between 1960 and 1962. The F.E. sources (D.L.F. loan No. 120 USEXIM Bank Loan etc.) for

the civil engineering works were tied up in 1958, i.e., after about 2 years from the approval of Planning Commission. Some delay in ordering of Gates (for main and subsidiary dam), radial gates, water conductor system has been made in as much as they have been ordered in 1960. This delay may be ascribed to the delay in according sanction by competent authority for the revised expenditure in 1960; the change in scope of project was made in 1958. The major civil works on power station were taken up 33 months later from the start of major civil work on dam in March, 1961. The invitation to tender for this work was made in 1960.

3.19.6 The Foreign Exchange source for electrical equipment was tied up in 6/60. The procurement action in the form of ordering of major equipment was made between 3/60 to 10/62. After 27 months from the date of commencement of major civil work in power station, the erection of T/G was taken up in May, 1963. The unit has been commissioned in January, 1965 i.e., 20 months later from the starting date of mechanical erection and the 2nd unit in April, 1965 i.e., 3 months thereafter. The 1st unit has been commissioned after 126 months from the date of submission of project report and 82 months from the start of major civil works on dam.

3.19.7 The major reasons for delay :

1. Change in scope of project;
2. Delay in administrative sanction;
3. Delay in foreign exchange tie-up;
4. Delay in ordering radial gates, gates, water conductor system, etc.

3.20 Sharavathy Hydro Electric Project—Stage II

3.20.1 This is an extension project of Sharavathy Stage-I envisaging the installation of 4 units of 89·1 MW in the 3rd Plan (two units each in 1964/65 and 1965/66). The scope of the project included the following :

1. Raising the height of Linganamakki dam by 24 ft.
2. Lining of second pressure tunnel.
3. Extension of the generating station and installation of 5 × 89·1 MW.
4. Lining of 2nd surge tank.
5. Installation of 2 MW house set.

3.20.2 The project is not complete yet and the data sumbitted by the project authorities are insufficient to make an analytical study of the project regarding the areas of delay. From the limited data it however appears that there has been some delay in the procurement of imported steel for penstock.

3.21 Jaldhaka Hydro Electric Project

3.21.1 This is a single purpose, single state hydro-electric project envisaging the installation of 2 × 9 MW hydro-generators. The project was a spill over from the Second Plan and was envisaged to come into fruition in the year of 1963/64 of the Third Plan. The station is ready but due to some site modification of the tail race arrangement, commissioning of the unit is further delayed. (The first unit has since been commissioned according to a report received in April, 1967).

3.21.2 The project investigation was initiated in November, 1956 and the consultant CWPC was appointed shortly after that in early 1957. The project authorities took quite a prompt action in this respect in appointing consultants even before the project was sanctioned.

3.21.3 The formal sanction of the Planning Commission was accorded on 7-5-1959 and after 6 months in November, 1960 the Executive Agency was appointed. Immediately thereafter in 1960, the preliminary work of the construction of colony and staff quarter was taken up.

3.21.4 The major works for water conductor system, however, were taken up in 1961 and those for the dam were taken up in 1963. The delayed start for the construction of dam was due to the fact that during excavation it was felt that the dam site was not suitable and hence it was decided to

shift it 1,100 ft. on the upstream side. The location of the surge shaft was changed, open channel was omitted and instead R.C.C. duct was decided. The diameter of penstock was also changed. These changes as a result of earlier inadequate investigation, affected the design, engineering and construction to a great extent and resulted in a delay of about 26 months.

3.21.5 In 1962, 24 months later, dating from the start of preliminary work, the concrete works in power station building were taken up. On 31st July, 1964 a severe flood caused considerable damage in the project inundating the power house and leaving 18 ft. silt in the power house building. The damages have been rectified and the construction is in the progress. This has delayed the project by six months.

3.21.6 The reasons contributing to the delay of the project are as follows :

1. Inadequate investigation resulting in change in barrage site and surge shaft and change in design of water conductor system;
2. Severe flood disaster in 1964;
3. Non-availability of scarce materials and cement;
4. Delay in procurement of construction equipment.

3.22 Ranapratap Sagar Power Station

3.22.1 The second stage of Chambal Valley Development is a multipurpose, inter-state hydro-electric project envisaging the installation of 4 × 32 MW hydro-generator of which one 32 MW unit was originally programmed for installation in 1964/65 and three more similar units in 1965/66.

3.22.2 The investigation for the scheme was started in 1948 and a project report was submitted in 1958. The authorisation by Planning Commission for taking advance action was accorded in 1958 itself. The formal sanction was, however, accorded in May, 1960. The formal sanction of the project by competent authority was accorded in February, 1961 *i.e.*, after 9 months from the date of formal sanction by Planning Commission.

3.22.3 The preliminary civil works (colony, staff quarter, site stores, etc.) were taken up some time in January, 1961. Simultaneously with the preliminary civil works, the major civil works for the dam (excavation work in dam site) were taken up on 15-1-1961 *i.e.*, 31 months later from the date of accord of sanction. The major civil works for the power station (concrete works in power station building) were taken up on 16-10-1965 *i.e.*, nearly 57 months from the date of start of preliminary civil works. The reason for this delay was due to change in scope of the project. The original design envisaged the construction of a major dam on Chambal River, a power dam in the Podajar Valley and the power house at the toe of the power dam. Due to geological and other difficulties, the construction of power dam was abandoned. The revised design envisaged the construction of main dam on Chambal River, power house in a deep pit at the toe of the main dam and the construction of 40 feet diameter tunnel to pass turbine discharge. The competent authority has taken 3 years in according sanction to the revised expenditure on account of the change in scope.

3.22.4 The major portion of the equipment was ordered between April, 1962 to November, 1962 and the delivery of the equipment was effected between March, 1964 to October, 1964. Procurement action for some of the balancing equipment (power and control cables, gantry crane) was taken in the middle of 1966 and the delivery of them is yet to commence. After 2 months from the date of commencement of major civil work, the erection of T/G was taken up in December, 1965. The erection of the units is not yet completed.

3.22.5 The delay in the execution of the project is due to the following :

1. Major change in the scope of the project mentioned earlier regarding change in location of power station.
2. Unsatisfactory foundation in a certain length of main dam on account of which foundation had to be taken to a depth of about 50′ as against 5′ to 10′ envisaged earlier
3. Delay in procurement of steel plates for crest gates.

4. Delay in erection of sluice gates due to late release of foreign exchange, transport difficulties and delay in the inspection of D.G.S.&D.
5. Delay in procurement of spare parts for grouting machinery.
6. Lack of availability of satisfactory detonators

3.23 Uhl River Hydro Electric Project—Stage II

3.23.1 This is a single purpose, single state hydro-electric project envisaging the development of power from the tail race waters of the existing Shanon Power Station by utilising the drop of about 1150 ft. before the water is led into Nari Nallah near Bari. In the original Third Plan Scheme it was programmed to install 4 × 10 MW in 1964/65. This was, however, subsequently changed at a later date and it was decided to install 3 × 15 MW hydro-generating units within the Third Plan and the Fourth unit in the Fourth Plan.

3.23.2 The project report was submitted in August, 1960 and it appears that not much of geological investigation for the project was made in the preparation of this report. As the power station was envisaged to use the tail race water of the existing Shanan Power Station a detailed routine survey of the catchment areas, as normally done, was not called for. The construction of a diurnal storage reservoir at Charpot having a storage capacity of 5·7 m.c.ft. was, however, already envisaged in the project report.

3.23.3 The formal approval of the Planning Commission was accorded 9 months later on 20-5-1961. No advance action was authorised by Planning Commission. The project authorities, however, accorded financial sanction in January, 1961 i.e., 4 months before the formal approval of Planning Commission was obtained, presumably, on being advised that the project was coming through. No consultant was appointed and all the design and engineering works were done departmentally.

3.23.4 Immediately after the financial sanction was given by project authorities, the land acquisition was initiated in January, 1961 and the project investigations were started in April, 1961. The preliminary civil works (site stores) for the project were taken up in July, 1961 (6 months later dating from financial sanction).

3.23.5 Subsequent to commencement of the project work the following major changes in the scope of the project were made :

1. Increase in unit capacity from 10 MW to 15 MW.
2. Conversion of major length of open flume to tunnels and covered flume.
3. Shifting the location of the power house from left side to the right side of Nallah on account of geological reasons.
4. Increase in capacity of power flume from 600 CS to 900 CS.
5. Alignment of pen-stocks and location of anchor blocks had to be altered for geological reasons.

3.23.6 The departmental sanction for the revised expenditure on account of the change in the scope of project was accorded in December, 1965 to expedite the construction though sanction from Central Government was still outstanding. The change in the scope of project was mainly due to insufficient geological investigations. The project appears to have made little headway as only the 1st stage of turbo-generator foundation has been completed and the concrete works in the power station building are yet to be completed.

3.23.7 The reasons for the delay are the following :

1. Major change in scope of the project due to geological reasons.
2. Delay in land acquisition.
3. Delay in delivery of equipment. The letter of intent for turbo-generator was placed on 11/63 and the target date of delivery of turbo-generator was August/September, 1965. The delivery has not yet started.

4. Delay in release of foreign exchange for switchyard equipment.
5. Legal proceedings.
6. The indent for hydraulic hoist was made in December, 1965 and the foreign exchange is yet to be released.
7. Delay in delivery of construction equipment (shovols).
8. Delay in procurement of cement, steel, detonator, spares, x-ray films, etc.

3.24 Bhakra Right Bank Power House

3.24.1 This project envisages the installation of 4 × 120 MW hydrogenerators on the right bank of Sutlej River as a part of the multi-purpose inter-state hydro-electric project. The dam and the left bank power house are already existing. Only 2 × 120 MW units were proposed to be commissioned by the end of Third Plan. The project investigation for the Right Bank Power House was already completed along with similar work of Bhakra Dam and Left Bank Power Plant.

3.24.2 The project report was submitted on 2-5-1960 and the sanction for starting project work was accorded immediately thereafter in 1960. After about 14 months on 25-7-1961 the formal sanction was accorded. The preliminary civil works as well as major civil works for the dam and water conductor system were not necessary as they had already been done during the construction of the Left Bank Power Plant.

3.24.3 The complete power plant and switchyard equipment were supplied from U.S.S.R. under Rouble Credit. The design and engineering work was done departmentally and the Longidroproekt, U.S.S.R.

3.24.4 The specifications were issued sometime in the beginning of 1963 and the delivery of equipment started in the 3rd and 4th quarter of 1964. The equipment deliveries were delayed by the U.S.S.R. authorities from 3 to 6 months for different items such as turbine runners, generators and transformers.

3.24.5 The major civil works for the power station (concrete works in power station building) were taken up in January, 1963 i.e., 18 months later dating from the date of formal approval of Planning Commission for the start of project work. It appears that this construction had taken only two months more than it was envisaged in the schedule. This was due to the longer time taken in assembly, welding and testing of scroll casing which in turn held up the second stage concreting. After 18 months from the date of commencement of major civil works, the erection of electrical equipment (Switchyard) was taken up first in July, 1964. The erection of hydro-generator was, however, taken up in December, 1964. The first unit was completed in May, 1966 i.e., after 22 months from the date when the erection of switchyard started and 17 months from the date when the erection of hydro-generator was taken up.

3.24.6 The project encountered the following difficulties :

1. Delay in fabrication of structures, civil works of switchyard and link line and due to late arrival of Soviet Specialist and due to black-outs, emergency, etc.
2. Due to shortage of water in pond on account of inadequate rainfall.
3. Delay in procurement of turbine, oil & grease.

3.25 Koyna Hydro Electric Project—Stage I

3.25.1 The first stage of Koyna Hydro Electric Project covers the installation of four Nos. 60 MW hydro-generators. In the targets fixed for the Third Five Year Plan it was envisaged that two units of 60 MW would be installed in 1961-62 and two more units in 1962/63. The first unit was commissioned in May, 1962 followed by other three units in September, 1962, January, 1963 and February, 1963. Thus, although there was some delay in the commissioning of the first unit, there was no short-fall in the overall completion of the first stage. It required 111 months for commissioning the first unit from the date of sanction.

3.25.2 The Koyna scheme was investigated in 1947 and a report was submitted to the Government in 1950, which was revised on the basis of restricted quantum of water available for power generation and submitted in December, 1952. Administrative approval was accorded in February, 1953 and preliminary works as access roads, colony, store, etc., were commenced in 1954. As the underground work involved in the project was being tackled for the first time in India, M/s. Societe Generale Power L' Industrie, Geneva were appointed as consultants in February 1955.

3.25.3 Tenders for main works like dam head race tunnel, ventilation and approach tunnel of power house were decided in March, 1956. The contractor for the dam started excavation in April, 1956 and concreting for the dam was commenced in March, 1958. Other works like head race tunnel, pressure shafts, power houses and appurtenances were also carried out at the same time. Specifications for main equipment were prepared between October, 1955 and March, 1956. Tenders were issued between March, 1956 and October, 1956 and the equipments delivered between October, 1958 and September, 1960.

3.25.4 Civil works of the power station proper were started in April, 1957 Erection of hydro generators was taken up in February, 1960 and concrete foundation for the first unit was completed by November, 1960.

3.25.5 Following reasons contributed to the delay :

1. Location of a shear zone in dam foundation;
2. Initial slow progress of excavation of inclined pressure shaft;
3. Delay in supply of explosive due to strike at explosive factory;
4. Leakage from intake gates;
5. Unprecedented rains.

3.26 Koyna Hydro Electric Project—Stage II

3.26.1 This is a single purpose, single state hydro-electric project envisaging the installation of 4×75 MW hydro-generators. Originally it was programmed to install 1×75 MW unit in 1964/65 & 2×75 MW units in 65/66. The fourth 75 MW unit was programmed to be installed in the Fourth Plan. The three units have been commissioned on April, 1966, June, 1966 and November, 1966.

3.26.2 The project report was submitted in July, 1960 and the approval of the Planning Commission was accorded 9 months later in April, 1961. The departmental sanction was authorised in July, 1962. The foreign exchange tie up (I.D.A. 24) was made in August, 1962. Some amount of foreign exchange for stage I tied up in April, 1959 included works for stage II also.

3.26.3 This being an extension of stage I, no additional investigations were necessary. Preliminary civil works like access roads, colonies, stores and major civil works like head race and tail race tunnels were not necessary as these were completed in the first stage.

3.26.4 The dam work was continued to a height corresponding to storage required for stage II development.

3.26.5 The major civil works in the form of excavation of pressure shafts were started in June, 1961 i.e., within 2 months from the date of accord of sanction by Planning Commission. The major civil works of power house concreting were started in May 1963 i.e., after 25 months dating from the sanction for starting project work by Planning Commission. The mechanical erection of equipment (turbo-generator) started in March, 1964. The first unit was commissioned 25 months later and the second unit two months thereafter. The third unit was commissioned after 5 months from the commissioning of the second unit. The fourth unit is not yet commissioned.

3.26.6 The time taken to commission the first unit from the date of submission of project report is 69 months & 35 months from the date of start of major civil works in power house.

3.26.7 The following are the major reasons for delay :

1. Butterfly valves supplied by a Yugoslav firm were delivered in September, 1965 instead of April, 1965 resulting in a delay of 7 months.
2. Steel lining of pressure shafts could not be started as scheduled as the imported winch was received late due to delay in issue of import licence. Import licence was received in September, 1962 i.e., 7 months, after the date of application.
3. Supply and erection of electrical equipment for stage II was originally planned on repeat order basis. It was, however, decided to invite fresh tenders and retendering took about 12 months.
4. Leakage in 220 KV oil filled power cables.

3.27 Sholayar Hydro Electric Project

3.27.1 This is a single purpose, single stage hydro electric project envisaging installation of 3 × 18 MW units in the Third Plan. All the three units were programmed to be installed in 1963/64. The first unit has been commissioned in May, 1966. The other two units have not yet been commissioned.

3.27.2 The investigations for the project were started in 1958/59 and the sanction for starting project work was accorded on 28-3-59 (i.e. after 30 months from the date of start of preliminary work). The delay in the approval of the scheme by Planning Commission was inter-state dispute. Until the inter-state dispute between Madras and Kerala regarding the utilisation of water in the Sholayar and other rivers was settled the scheme was not approved by Planning Commission. The preliminary civil works (access roads) were started in 1956/57 i.e., simultaneously with project investigations. In this respect the project has been quite prompt in action.

3.27.3 The departmental formal sanction was obtained on 31st January, 1960 and the foreign exchange source was communicated in February, 1961, after 23 months from the date of accord of sanction by Planning Commission. No consultant was appointed and the design and engineering of the project was done departmentally.

3.27.4 The major civil works in the form of construction of coffer dam were taken up on 19-2-60 i.e.,14 months from the start of preliminary work. This coffer dam was completed under two contracts. The work on first contract was started on 19-2-60 but presumably the contractor could not finish the work. Subsequently, a second contract was entered into and the job was started in November, 1960 and completed in May, 1961. A delay of about 8 months has resulted due to this.

3.27.5 From the replies received it is difficult to ascertain the date of commencement of major civil works on the main dam. It however, appears that some major change in the scope of work was involved in its construction as the dam was first designed without taking into consideration the seismic forces but later on the section of the dam was increased to withstand the seismic forces. This change in scope may be mainly attributed to a design based on insufficient data rather than lack of proper investigation. The major civil works on the power house was started in September, 1962 afrer 72 months from the start of civil works.

3.27.6 The project authorities initiated the procurement action quite early in as much as tenders for main electrical equipment and crane were issued in December, 1959. The sanction for the purchase was conveyed along with the foreign exchange tie-up. The procurement schedule of equipment had not been furnished. It appears that the supply of the turbo-generator equipment by the Yugoslav manufacturers of plant has been delayed considerably. The supply of equipment for the first unit is complete but the major portions of the equipments for the second and third units have not yet been supplied. After 34 months from the date of start of major civil works in power station the erection of turbo-generator started. The erection of crane was started 14 months earlier than the start of turbo-generator erection.

3.27.7 The first unit has been commissioned in May,1965 i.e., in 32 months from the starting date of commencement of major civil works in power station and 75 months from the commencement date of major civil works (coffer dam). The erection of other units is in progress.

3.27.8 The major reasons for delay are as follows :

1. Inter-state dispute between Madras & Kerala regarding utilisation of Sholayar & other rivers.
2. Change in dam design due to improper design considerations resulting in increased masonry work.
3. Delayed execution of work on coffer dam due to inability of first contractor to execute the work. This necessitated to go in for another fresh contract and get the job completed.
4. Considerable delay in supply & erection of equipment by Yugoslavia manufacturers of plant. The supply of major equipment for units 2 & 3 is still to be effected.

3.28 Sabarigiri Hydro Electric Project

3.28.1 This is a single purpose, single state, hydro electric project envisaging the installation of 6 × 50 MW units. It was programmed to install 2 × 50 MW units in 1964/65 and 3 × 50 MW units in 1965/66. The sixth unit was scheduled to be installed in the Fourth Plan. The 1st, 2nd and 3rd units have been commissioned in April, 1966, June, 1966 and December, 1966 respectively.

3.28.2 The enlarged Pamba-Kakki project was formulated in July, 1959 and the investigations were completed after about a year or so. The Project report was submitted in November, 1959 and advance action was authorised by Planning Commission in 1960/61. The formal approval of Planning Commission was accorded in August, 1960. The formal sanction of the project by competent authority was accorded in February, 1961.

3.28.3 The foreign exchange sources (A.I.D. Loan Agreement No. 34) was communicated in July, 1962 after 23 months from the date of formal approval by Planning Commission. The consultant was appointed in September, 1962 i.e., 25 months after the formal approval for start of project. Presumably, the project authorities could not initiate any action as the foreign exchange source was not tied up.

3.28.4 The data submitted by the project authorities do not indicate the date of commencement of preliminary as well as major civil works. The work on the dam (Kakki & Pamba) started in November, 1961, i.e., after 39 months from the date of formal approval of Planning Commission and that on the Flanking dam started in November, 1963. The following major changes were made in the scope of the project :

1. The height of dam was raised by 10′ to increase the live storage of the reservoir.

Subsequent to taking up the work the following changes were also made :

1. Due to major earthslip in the switchyard portion of the power house area in July, 1963, the layout of the yard had to be modified and consequent on this the centre line of the jet had to be raised by 5′.
2. The mode of construction of Kakki dam was changed from masonry to concrete.
3. The spillway for Kakki reservoir was shifted to a saddle just adjacent to flanking dam on the right bank and the spillway capacity increased from 47,800 cusecs to 63,000 cusecs.
4. Gated spillway in place of ungated spillway as contemplated earlier for the Pamba dam.

3.28.5 The mechanical erection for units I, II and III commenced in April, 1964 and the units have been commenced as follows :

Unit I	. 4/66 i.e., 56 months from the start of major civil work for the dam.	
Unit II	. 6/66 i.e., 58	Ditto.
Unit III	. 12/66 i.e., 64	Ditto.

The 1st unit has taken 77 months from the date of submission of project report and 56 months from the start of major civil works.

3.28.6. The reasons for the delay as could be ascertained from the limited data are as follows :

1. Delay in foreign exchange tie-up.
2. Change in scope of design.
3. Major revision of design due to difficulties encountered subsequent to taking up the work
4. Some difficulty in getting release of foreign exchange and opening of letter of credit.

4. AREAS OF DELAYS

4.1 General Observation

From the project performance data annexed to this report, several pertinent points seem to emerge as follows :

4.1.1 Out of 16 thermal and 10 hydro projects (aggregate capacity 4·828 million kW), the performance of which has been studied by the Committee, advance authorisation or formal sanction for 11 thermal projects was issued between April, 1959 and September, 1961 and for five thermal projects, between September, 1961 and June, 1963. The foreign exchange for the first group was tied up between January, 1960 and May, 1963 and that for the second between January, 1962 and May, 1963. The inclusion of the second group (aggregating 725 MW) in the Third Plan target decided in September, 1961 would appear somewhat unrealistic and *ab initio* some element of doubt was introduced as to the feasibility of implementation.

4.1.2 Delay in issuing appropriate sanction to the project results in pushing back all the subsequent processes and ultimately the commissioning date. Such delay was seen to occur due to (1) Prolonged correspondence between CWPC and State authorities for clarification of project details and (2) routine to be followed in obtaining clearance for the project. Both would seem controlable as discussed hereinafter.

4.1.3 At the time of submission of the project report, the emphasis was generally on the justification of the project in the context of increased power demand and some indications of foreign exchange requirement and the financial results showing the viability of the project. In several cases project reports were received with inadequate details and approved. Such projects sanctioned without adequate investigation were delayed during process of execution. In case of hydro projects, inadequate investigation often resulted in major changes in the scope of work and design which meant considerable delays.

4.1.4 A large time lag between advance authorisation and foreign exchange tie-up had in several cases resulted in delayed beginning or atleast slow progress during the initial stages. Projects authorities were found to be somewhat reluctant or unable to proceed fast until the project was firmly tied up in all respects. Administrative sanction and adequate provision of funds were also another factor which caused slow progress during the initial stage.

4.1.5 Timely appointment of a competent consultants for thermal projects had manifestly benefitted the project authorities particularly those who were not suitably organised in this field, in that, all phases of the project work were carried out in a systematic manner. On the other hand, delayed appointment had adversely affected the programme. The absence of a suitable Indian Organisation under the consultants also delayed the programme.

4.1.6 The complexity of procurement routine from the issuance of tender specification to the issuance of import licence or opening of letter of credit, which had a bearing on the delivery of equipment, had, in many cases upset even a pre-planned construction schedule. The adverse effect was more pronounced in cases where procurement of different equipment was arranged from different sources.

4.1.7 Lack of vigilance on follow-up actions in the field of co-ordination between various agencies, programming and scheduling, shipment, customs clearance, despatching and replacement against transit losses and damages caused considerable delays. It is inferred that in many cases the organisation was not suitably equipped.

4.1.8 Due to interdependence of design, procurement and field construction, there was the imperative need for mapping out all complementary actions in sufficient details and in advance to avoid hold ups in various phases of the work. A detailed schedule of this type was found missing in many cases, particularly in aided projects obtaining all the imported equipment from one source. Complete dependence on foreign suppliers was observed and their lapses resulted in delays.

4.1.9 Construction of different projects progressed differently and the causes of delays had also varied rather widely—from delay in sanctioning the project to delay arising out of emergency conditions due to Chinese aggression or conflict with Pakistan. Not all of them, however, affected the end point. Parallel actions or operations were possible with the result 9 months' delay in any particular item ultimately reflected in a month's delay in the commissioning date. There were, however, steps which, if once delayed, continued to effect successive actions down the line resulting ultimately in delay in commissioning. For the purpose of achieving the target, such steps deserved anticipation and timely action.

4.1.10 In case of thermal projects, once the major civil works at site commenced, the field construction appeared to progress more or less in an orderly manner, subject to certain variations which could generally be predicted within limits. In other words,. from this stage, the project came under reasonable control of the construction organisation and its course became defined. The position was not quite so during the pre-construction stage in which several agencies were involved. This point of time viz., commencement of major civil works at site could be considered as a distinct dividing line of the total project implementation period for two broad phases of the project.

4.1.11 Out of 16 thermal projects studied, the first unit at Neyveli Stage II (50 MW) was commissioned in 26 months from the date of commencement of major civil works at site. This was a repeat unit and manufacture had started in advance. This accounted for the short period indicated. The second unit (100 MW) in the same power station would require 46 months (likely commissioning date April, 1967). The actual construction period for commissioning of the first unit in nine projects (*vide* Appendix 12) varied between 31 and 39 months although the variation in the first phase was wider. The corresponding period for the remaining six projects had varied between 40 and 48 months. The extension of the construction period in case of the latter group was mainly due to (1) reasons beyond control of the project authorities (2) delayed actions in the first phase and (3) unforeseen difficulties (natural hazards, war situation and the like). There was considerable time lag between commissioning of the first unit and that of the second and subsequent units. In several cases the reasons were somewhat beyond the control of the Project Authorities. Cannibalisation to complete the first unit out of the other due to delayed receipt of replacement against transit losses or damage, resulting from the cumbersome procedures or failures of vital components during the trial period of subsequent units or labour strikes are typical examples of such delays. On the other hand in some of the projects, the reasons for delay in commissioning the second unit appear controllable. Time taken for strengthening the depleted construction organisation due to diversion of construction personnel to operation, delayed action by Project Authorities in obtaining statutory licences for explosive, clearance from Electrical Inspectors, etc., are examples of the latter type of delays.

4.1.12 On the hydro side, the period of construction at site varied between 5 and 7 years. The variation in the period for the first phase was even wider. In most of the cases the delays during the construction period could be directly or indirectly attributed to inadequate investigation, particularly geological investigation and firm design of civil engineering works apart from other reasons mentioned earlier.

4.2 Causes of Delays

4.2.1. The various causes of delays as observed in the implementation of Third Plan Schemes are listed below separately for thermal and hydro projects.

I. *Thermal*

1. Lack of adequate project data.
2. Inadequate investigation before finalising technical project report.
3. Major change in scope of work.
4. Delay in site selection and land acquisition.
5. Delay in issue of authorisation by Central and/or State authorities.
6. Delay in foreign exchange tie-up.

7. Deficiency in organisation for planning and engineering the project.
8. Delay in appointment of consultants wherever required.
9. Lack of local organisation of consultants resulting in delay in communicating decision.
10. Delay in procurement of equipment due to :
    (*a*) late issue and late finalisation of tenders;
    (*b*) procedural delays in processing through D.G.S. & D.
    (*c*) processing of foreign exchange release by Govt. of India.
11. Delay in levelling and dressing at site due to :
    (*a*) inaccessible nature of site;
    (*b*) delay in procurement of construction equipment.
12. Late receipt of erection drawings.
13. Delay in procurement of construction equipment like tower crane, Gantry crane etc.
14. Shortage of cement and steel, welding rods, explosives, etc.
15. Late arrival of erection specialists.
16. Delay in delivery of equipment due to :
    (*a*) failure of supplier to keep up schedule;
    (*b*) lack of ships, port strikes etc;
    (*c*) over carriage of equipment;
    (*d*) impounding of equipment in Pakistan.
17. Difficulties in transporting equipment to site :
    (*a*) in moving over dimensional packages on railway due to restrictions imposed by bridges tunnel etc.
    (*b*) Due to lack of suitable rolling stock, etc.
    (*c*) Due to difficult terrain and lack of proper access routes.
18. Delays in getting replacement for items of equipment damaged or lost in transit.
19. Lack of proper planning and co-ordination of various construction schedules and failure to anticipate delay in case of critical phase of construction activity in advance.
20. Labour strikes and civil disturbances.
21. Unprecedented rains and floods.
22. Difficulties experienced due to change in the course of lean water flow in river.
23. Change in top personnel in the course of implementation of project.
24. Stoppage of work due to enemy action.

II. Hydro

1. Inadequate investigation before finalising technical project report.
2. Major change in the scope of work like :
    (*a*) change in the location of dam;
    (*b*) change in design of dam foundation;
    (*c*) change in design of Water Conductor System;
    (*d*) change in location of power station and switchyard;
    (*e*) change in generator capacity.
3. Delay due to inter-state aspects.
4. Delay in issue of authorisation by Central and/or State authorities.
5. Delay in foreign exchange tie-ups.
6. Change in key personnel in the course of advance planning and execution.

7. Delay in procurement of equipment due to :
   (*a*) late issue and late finalisation of tenders;
   (*b*) procedural delays in processing through D.G.S.&D.
   (c) processing of foreign exchange release by Govt. of India.
8. Delay in procurement of construction equipment.
9. Shortage of cement and steel, welding rods, explosives, etc.
10. Shortage of spare parts for construction equipment.
11. Late arrival of erection specialists.
12. Delay in delivery of equipment due to failure of supplier to keep up schedule.
13. Difficulties in transporting equipments to site :
   (*a*) in moving over dimensional packages on railway due to restrictions imposed by bridges, tunnels, etc.
   (*b*) Due to difficult terrain and lack of access roads.
14. Unprecedented rains and floods.
15. Land acquisition and rehabitation.

5. RECOMMENDATIONS

5.1 Having reviewed the various areas of delays in project implementation, the Committee would recommend as follows :

5.1.1 A close scrutiny of the status of the projects included in any plan should be made before formulation of each Five Year Plan, with a view to fixing a realistic target which would reasonably be expected to be achieved.

5.1.2 By and large, inadequate investigation could delay the various phases of the project and as such greater importance should be attached to this aspect. No project should be sanctioned unless it was fully investigated. This would only mean that with a longer lead time prior to the sanctioning of the project but with appropriate planning in this direction, it would be possible to match up this part of the work for implementation of the project during a particular plan period.

5.1.3 Since the investigation work for the hydro scheme is much more extensive, it would need a greater degree of collaboration between Centre and State in case of very large and inter-State projects to complete this part of the work in time. The investigation work for hydro projects should be placed under the charge of experienced engineers not below the rank of a Superintending Engineer. In this context a master plan for hydro project should be worked out. Similar principles should also be applied to thermal projects but the detailed work associated with thermal schemes might be left to the care of States. It would be necessary for the CWPC to take the initiative and maintain a close liaison with the States during investigation and preparation of master plans.

5.1.4 One of the reasons for delay in sanctioning a project is an inadequate project report submitted by the States. Such reports should give full account of the investigations carried out, major technical details, fund required, indication of construction materials and equipment together with a schedule of action and programme of construction, existing organisation and the need to augment it, brief details of utilisation of power etc. This will be in addition to the information usually given regarding power demand, financial results etc. The Planning Commission have already circulated a proforma, guideline for preparation of project report. As CWPC will be the official examining body, the proforma already circulated should be reviewed by them and amended as necessary to obtain fuller information in respect of thermal and hydro projects.

5.1.5 The Committee has observed that considerable time is being taken at present in giving approval to the project by the concerned departments at the Centre and State. According to the present procedure, the State Governments are required to submit detailed project reports to the Central Water & Power Commission, Ministry of Irrigation and Power and the Planning Commission for examination and approval. On the basis of such examination the CW&PC submits its comments to the Technical Advisory Committee set up by the Planning Commission for examination, which advises the Planning Commission on the merits of individual projects. In a number of instances the Committee noted that prolonged correspondence and consultations between CW&PC and the State Project authorities had resulted in delayed submission of comments for consideration by the Technical Advisory Committee, which is mainly due to inadequate data and information in the project report. The Committee noted that although a representative of the Deptt. of Co-ordination (Ministry of Finance) was co-opted on the Advisory Committee yet all new projects estimated to cost Rs. 5 crores and above though recommended by the Advisory Committee were again referred to that Department by the Planning Commission for getting its clearance before giving its approval. The Committee fails to appreciate the utility of the second reference to the Department of Coordination. The Planning Commission's approval should be issued as soon as a project is recommended by the Technical Advisory Committee.

5.1.6 In order to encourage detailed investigations as envisaged, adequate funds should be allocated in each Plan for investigation of hydro and thermal projects. Investigation of thermal schemes in advance should be given greater consideration. Association of consultants from this stage particular in thermal projects would be an expediting measure.

5.1.7 The tie-up of foreign exchange, if involved and for which an indication should have been given in the project report should be communicated to the project authority without a large time-lag. It was often seen that active work on the project was not taken up until this was formally advised.

5.1.8 The commencement of civil work of some of the projects was delayed due to late ordering of construction material like steel, cement etc. The Committee is of the opinion that there cannot be any valid reason for the lapse on the part of the project authorities. The requirement of such materials can be estimated and included even in the project report and procurement action can be initiated as soon as the project is formally sanctioned. Proper co-ordination in this regard can be achieved between CW&PC and the project authorities for early supply. Often the work was held up due to non-receipt of special steel sections and plates. With close vigilance and co-ordination it may be possible to minimise delay on this account, if not obviate them altogether.

5.1.9 The procurement procedures have seriously affected the construction programme and hampered construction progress in many vital projects. There is scope for streamlining the procedure so as to avoid delay in the construction programme. There are many aspects involved in the procurement procedure. One of them is the agency for purchases. The study made in this connection is given hereunder.

5.1.10 The purchase of equipment has generally been handled by one of the two agencies *viz.* (1) Project authority itself (2) Central agency like the DGS&D. The time taken for the purchase action in all cases can be divided into two broad stages, the first stage commencing from the time of issue of tender enquiry or the time of placing the indent on DGS&D, to the time of issuing a letter of intent on the prospective supplier, and second stage comprising the time taken from the issue of letter of intent to the issue of import licence/letter of credit, which has a bearing on the deliveries.

5.1.11 The data furnished in response to the questionnaire issued by the Committee has been analysed in respect of purchases connected with thermal power stations.

5.1.12 Data of the time taken from the receipt of tenders to the issue of letter of intent on 79 purchase cases handled through the DGS&D and 65 cases handled by the project authorities themselves was available. The time allowed for tendering is governed by practice and generally fixed within certain limits, and may be conveniently excluded from the analysis. The available data has been analysed and plotted in Appendix 14. It is revealed that the time taken varies from 1½ months to maximum of 29 months. In about 50% of the cases the time taken was about three months to six months. In about 10% of the cases the time taken was from 11 months to 14 months. It is generally observed that the time taken by the DGS&D is more than the time taken by the Project Authorities. To this another period of five/six months will have to be added to cover the time taken from the preparation of the specifications by the project authorities and the time of receipt of date of issue tenders. The Committee is of the opinion that the total time taken from the preparation of the specification to the decision on the tender should not be more than six months and in rare cases involving longer tendering time upto 10 months. It will go a long way to cut down the time if project authorities are allowed to deal with the tenders directly.

5.1.13 The second phase of the procurement action comprises the release of foreign exchange after getting DGTD clearance and issue of import licence and opening letter of credit. From the data furnished in response to the questionnaire circulated by the Committee it was possible to collect 48 cases of purchases handled by the project authorities and 36 cases through the DGS&D for which this information was available. This has been analysed and plotted in Appendix 15. It is seen from this that this phase of procurement has taken from half a month to as much as 30 months in certain cases. In 50% of cases the project authorities have taken more than 10 months and the DGS&D more than six months and in 20% of the cases the project authorities have taken more than 14 months and the DGS&D more than 12½ months. The performance in this phase is also no better and there is a very strong case for streamlining these procedures to cut down the time required in complying with these procedures which being only a matter of form are not productive. It should be possible to cut down this time to a maximum of about three months.

5.1.14 These lengthy procedures are not likely to be of great consequence in subsequent plans, when greater and greater proportion of indigenous equipment will be used and at least the delays involved in the process of foreign exchange release and issue of import licence will be minimised.

5.1.15 The Committee would recommend that all project purchases other than rate contract items should be arranged by the project authorities. This will expedite the issue of letter of intent which marks the beginning of the engineering and design which, if delayed, will postpone the commencement of major civil work at site. It is essential that the project authorities should get themselves fully conversant with the time schedule for designs, deliveries of the various types of major equipment and on the basis of this prepare a suitable PERT programme or C.P.M. curve and phase the issue of tenders of the various auxiliary equipments, etc., accordingly. The project authorities should be time conscious.

5.1.16 The next step in the process is the release of foreign exchange against import proposals. The time taken for this purpose has, on the average been long although foreign exchange was tied up in advance. Delay in release of foreign exchange holds up issuance of import licence which in turn affects opening of letter of credit wherever necessary. The delivery of equipment is thus delayed. The routine involves examination as to the propriety of imports from indigenous angle and a considerable time elapses before this examination is through. Some streamlining is needed. The Committee, therefore, suggests that as soon as availability and source of foreign exchange have been formally confirmed and its release agreed to by the Ministry of Finance for any particular project for which advance intimation can be furnished to them, the Ministry of I & P who should satisfy themselves as to the need and propriety of imports, should have authority to release the foreign exchange without further reference to the Ministry of Finance. Examination of DGTD from indigenous angle should be waived if :

(a) There is no tender from indigenous manufacturers;

(b) the price of indigenous equipment is higher than landed cost of imported equipment *plus* 15% on such other percentages as may be fixed by the Government of India from time to time and the saving is substantial;

(c) the delivery of indigenous equipment does not suit the project construction schedule.

This seems to be the minimum requirement to expedite this part of the work. A statement to this effect may, if necessary, be issued by the Ministry of I&P to the Ministry of Finance and DGTD for record purposes.

5.1.17 The routine for obtaining replacements against losses in transit and transport damages requires some revision in the light of the experience that foreign exchange allocation from the Indian Insurance Company has taken usually long time causing delay in project implementation. It is recommended that since there is agreement between the Ministry of Finance and Indian Insurance Company regarding foreign exchange allocation for replacements, prompt allotment should be made by Ministry of Finance in the first instance against formal request made by the project authorities pending settlement with the Insurance Company who will get it reimbursed.

5.1.18 Standardization to the extent possible in the field of lay out, civil design, auxiliaries and common facilities is recommended to reduce the engineering and design time for thermal projects. Upto the Third Plan period bulk of the major power equipment was imported from various countries in the world following somewhat different standards. The size and type of the plant also varied widely. The scope for standardization was limited. Even so during the Third Plan period procurement of some major equipment in bulk for several thermal projects yielded substantial price advantage. With the programme of indigenous manufacture of limited number of sizes of power units (55 MW, 100 MW, 110 MW & 120 MW) allotted to various projects, the scope for standardizations should be fully explored keeping in view the local manufacturing capacity. This step is likely to yield better results. Depending on site conditions and since procurement has to be arranged through competitive bids, some variation is normally to be expected; but standardization of some broad features should be worked out, which will reduce the time generally involved in alternative studies for a new power station and thereby minimise the engineering and design time. In certain aspects the actual

construction time will also be reduced. The Committee would however point out that the benefits of standardization will accrue from repetitive jobs involving minimum variation in the size and type of the plant. This point has to be kept in view while deciding on a large scale change in the size and type of power units for future Plans.

5.1.19 The scope for standardization for hydro projects appears limited due to large variation in the type of development depending on the topography and natural features. Even so there is considerable scope for standardization of certain machines and structures of the power station.

5.1.20 Slow progress of civil works has in several cases upset the time schedule for plant erection. It was often not possible to obtain services of reputed civil contractors with resources, and contracts had to be awarded on lowest bid basis. This has the potentiality of creating a bottleneck in the field construction programme. Often the lack of construction machinery has slowed down the rate of progress. The Committee recommends that the project should own a limited number of construction plant and machinery to supplement the work of the contractor and the same machinery can be rented out.

5.1.21 The responsibility for coordinating at various levels and scheduling of works, generally rests with head of the technical organisation (Chief Engineer). Since anticipatory and follow-up actions should be vigorously pursued and a close vigilance has to be kept continually during various phases of the project to avoid hold ups, he would need substantial assistance in this field. For this purpose each project should create a separate planning, co-ordination and progress cell placed under the charge of senior officer directly responsible to the Chief Engineer. Correspondingly, the progress directorate under the CW&PC should be appropriately equipped to watch and follow the progress of each project in greater details than hitherto and render active assistance in removing hold ups at all stages of the project work. The name of the States representative should be formally communicated to CW&PC and similarly the States should also be advised about the arrangements made in CW&PC to ensure quicker follow-up actions and exchange of information in the interest of the work. The project organisation as mentioned above should have the services of a "Customs clearance and transport officer" who, as the name signifies would be responsible for traffic management.

N.B.— In submitting the above recommendations the Committee has assumed that necessary transmission lines for utilisation of power would be ready simultaneously with the commissioning of the generating unit.

2. In case of thermal projects tied to captive mining programme, regular coal supply to match with the completion of the project has to be ensured. Advance action as necessary for this purpose should be taken by the appropriate Ministry and the co-ordination involved has to be achieved at inter-ministeral level.

6. TIME SCHEDULE AND MODEL PROGRAMME

6.1 As already stated, the entire process of execution of the project from its conception to the commissioning falls into two distinct phases. The first one from the conception to the commencement of construction of major civil works at site and the second one comprising construction, testing and commissioning. The second phase of the work is actual field construction whereas the first phase comprises of various sanctions, approvals, engineering coordination, procurement etc., which have to precede the productive phase. The activities of the first phase generally comprise the following :

1. Approval of the project by the Central Government.
2. Allocation of funds and administrative approval of the project.
3. Tying up of foreign exchange sources.
4. Preparation of specification and invitation of tenders.
5. Land acquisition where necessary.
6. Tender invitation scrutiny and issue of letter of intent and contract finalisation.
7. Clearance from indigenous angle and release of foreign exchange.
8. Issue of import licence.
9. Opening letter of credit wherever necessary.
10. Detailed design which will continue even after the second phase starts.
11. Preliminary works.

The second phase, on the other hand will comprise :

(a) Field construction, civil, mechanical and electrical; and

(b) Testing and commissioning.

6.2 In order to ensure smooth and uninterrupted progress of the project it is of utmost importance to carefully plan in very great detail the numerous complementary activities of the project. These activities have considerable inter-dependence on one another and often restrain other activities. A thorough coordination of all these activities is required from the very beginning. It is necessary to foresee these activities and the inter-action of each other to be able to arrive at a rational programme for the execution of the project. For many projects this aspect does not seem to have received due attention during the Third Five Year Plan. The most convenient and effective method of programming is to adopt the PERT network which clearly indicates the interaction of the various activities and with reasonable durations assigned to them, a very realistic time schedule for the project can be made. This procedure also enables better man-power planning and compression of some of the activity durations to achieve the most expeditious completion of the project. It also enables the project authorities to get a clear perspective view of all the inter-related activities and pin point the critical operations and thus it affords a means to control the progress so as not to materially affect the final completion target. It is recommended that all the project authorities should adopt this method of programming and controlling the progress.

6.3 From the data received from the various project authorities a study was conducted to determine the range of duration of some of the major activities for the projects. Utilising the findings of this study and keeping in view the problems associated with indigenous industries a model PERT (Programme Evaluation and Review Technique) network each for a thermal and hydro project has been drawn up and annexed to this report *vide* Appendices 16 and 17.

6.4 For thermal project the period of 54 months (vide Appendix 16), reckons from the date of authorisation/formal sanction to the commissioning of the first unit at a new site. A time lag of four months for each successive unit, if all the units have been sanctioned at one time, is normally to be

expected. This total period for an extension project will be shorter, the extent of which will depend on the facilities provided in the previous stage of development but it is not likely to make a material difference for the purpose of fixing a plan target. There will be a lead time of about 24 months preceding the sanctioning of the project to cover adequate investigation, preparation of project report and its acceptance at the State level, examination by the Centre and final issuance of formal approval. Thus a total period of 6½ years is to be assumed for purposes of planning.

6.5 On the other hand the time required for execution of a storage hydro project of average complexities is about six years reckoning from the date of authorisation/formal sanction to the commissioning of the first unit. A lead time of two to four years depending on the type of development and topography, preceding the formal sanction of the project is required to cover adequate investigations, preparation of project report and its acceptance at the State level, examination at Centre and final issuance of formal approval. For purposes of planning a total period of 8 to 10 years should be assumed for hydro project of average complexities. The total period may be longer if the project is an Irrigation-cum-Power Project or if it involves inter-State problems. In fact, because of possibility of a large variation in the scope of work or in complexities, a model programme is difficult but for purposes of formulation of Plans, the period indicated in the annexed PERT network would provide a reasonable basis.

7. PROSPECTS OF THE FOURTH PLAN

7.1 At the end of the Third Plan, the total installed generating capacity was 10·17 million kW. The target to be achieved at the end of the Fourth Plan has been tentatively fixed at a little over twenty million kW after allowing for retirement of obsolete and old generating sets. According to the statement prepared by Ministry of Irrigation & Power, the addition during the Fourth Plan shows the following pattern :

A. *Continuing Schemes*	
1. Thermal	3·407 million kW
2. Hydro	3·277 million kW
B. *New Schemes*	
1. Thermal	
(a) Imported units	1·493 million kW
(b) Indigenous units	1·995 million kW
2. Hydro (Imported and Indigenous) . . .	0·786 million kW
TOTAL .	10·958 million kW

The list of schemes included in the above has been given in Appendix 18 and their locations are shown in the map attached as Appendix 19.

7.2 The Committee has reviewed the progress and the present status of the projects included in the above and its assessment of the Fourth Plan prospects is as follows :

7.2.1 *Projects which will be completed*

All the continuing thermal schemes totalling 3·407 million kW plus 1·223 million kW of imported units and 0·32 million kW of indigenous units will be fully implemented. On the Hydro side, out of the 3·277 million kW capacity of continuing schemes, 2·507 million kW will be commissioned. Out of the new schemes aggregating 0·786 million kW, it is expected that 0·183 million kW will also be commissioned.

7.2.2 *Projects which are marginal*

The projects that come under this category and the action that should be taken to ensure their completion within the plan are given below :

(a) *Imported thermal units* (270 MW)

(i) *Nagpur (Stage I)*—120 MW *(Ist unit)*—If the foreign exchange is released in May, 1967 and import licence for imported components of indigenous boilers can be issued by 31-5-1967 this will be completed. Even the second unit which has been assumed to be ready in the first year of the Fifth Plan has the chance of being completed within the Fourth Plan.

(ii) *Durgapur Project (Stage IV)*—150 MW—Based on present day delivery promises of American boiler, the letter of intent should be issued latest by the 1st week of November, 1967. For this purpose the tender should be invited latest by June, 1967. The consultancy agreement should be signed latest by May, 1967. Procurement action for turbo-generator should be initiated simultaneously. If this programme can be adhered to, the unit may be commissioned in March, 1971. The tender documents may be prepared accordingly.

(b) *Indigenous thermal units* (725 MW)

(i) *Kothagundam (Stage III)* 220 MW—(2×110 MW, BHEL)—These units have been tied up with this project in March, 1967. If at least one of the units is to be installed in the Fourth Plan, the consultants should be appointed forthwith so that design and engineering work can start and formal

orders can be placed with BHEL. This in turn will enable BHEL to complete procurement action for necessary imported components and raw materials. This should be done immediately. The civil works at least in the boiler house area should be completed latest by the 1st quarter of 1969. This would depend on (1) BHEL's ability to furnish all technical details of their equipment to suit the above civil construction programme and (2) supply and fabrication of steel work. The delivery of the equipment as promised should be maintained at all costs. The foreign exchange release for imported balancing equipment as necessary should not present any difficulty.

(ii) *Badarpur (Ist Stage)*—200 MW (2 × 100 MW, BHEL)—The delay in clearing the EFC memo. which in turn has held up creation of suitable construction organisation, seems to rule out the possibility of installing the 2nd unit within the Fourth Plan period. The engineering and design work has made some headway. For completing the first unit, it is imperative that financial sanction be issued immediately and early steps taken to set up the construction organisation and augment the Thermal Design Directorates of Central Water & Power Commission. If ordering of steel is further delayed, it will seriously affect the construction programme. BHEL would have to expedite supply of technical information not yet fully available. The work of BHEL, Hardwar factory would have to be accelerated.

(iii) *Delhi 'C' (Stage III)*—55 MW (BHEL)—The decision to appoint CW&PC as consultant for this extension project has been communicated only recently. The engineering and design work is being taken up. The Thermal Design Organisation under CW&PC would need augmentation to be able to produce a large number of construction drawings as required to suit the programme of work. Subject to no hold up on account of (1) steel work and (2) foreign exchange for several balancing items, the unit is likely to be commissioned before March, 1971.

(iv) *Chandrapura (Stage III)*—120 MW (First of 2 units, HEL)—Formal approval to this project should be issued immediately and consultants appointed early to accelerate the engineering and design work. The question relating to foreign exchange for imported raw materials and components for boiler should be settled soon to enable the indigenous manufacturers (AVB) to plan their programme. In this case also, advance action for power station steel work is necessary. The foreign exchange source for several items of balancing equipment should be communicated as soon as possible. It has been assumed that the delivery of indigenous T.G. units and boiler would be maintained.

(v) *Harduaganj (Stage IV)*—110 MW (2 × 55 MW, BHEL)—The consultants have been appointed only recently. The engineering and design work has commenced. U.P.S.E.B. are presently installing 2 units of 50 MW each being supplied by USSR. The additional two BHEL units would place a heavy burden on the organisation at site which will need to be suitably augmented. Necessary steps should be taken in advance. Procurement action for steel as also for equipment outside the scope of BHEL supply should be expedited.

(vi) *Santaldih*—120 MW (Second of two units, HEL)—This project is well under way. If there is no hold up on account of steel or 400 kV equipment, the 2nd unit may also be commissioned within the Fourth Plan period.

(c) *Hydro Units* (693 MW)

(i) *Gandak (continuing)*—15 MW—The civil works being executed by NPCC should be stepped up. The project authorities should prepare a detailed programme in consultation with NPCC. Ordering of indigenous equipment should be completed early.

(ii) *Kotah (continuing)*—100 MW—The concreting of the main dam itself is yet to start. As this process is completely mechanised, this work can be expected to progress speedily. The project authorities should stock adequate spare parts required for all the construction equipment to ensure uninterrupted progress. Some difficulty is being experienced in the procurement of steel plates for the spillway gates for the Dam. The question of obtaining the steel plates should be vigorously followed and the steel allotment obtained expeditiously and given to M/s Jessop & Co. who have to fabricate the gates.

(iii) *Idikki*—130 MW—Only one unit of 130 MW out of the 3 × 130 MW to be installed at this station is expected to be commissioned within the Fourth Plan.

Ordering of the turbine and generator as also of the construction equipment should be expedited. If this is dependent on the loan agreement, steps for signing the same should be immediately taken. The delivery of generating equipment should be guaranteed to complete one unit by 1970-71. A programme of simultaneous execution of civil works at different sites will have to be carefully planned in advance. It is estimated that the total outlay during the Fourth Plan would be of the order of Rs. 55 crores and this will indicate the magnitude of the task involved.

(iv) *Kundah (New)*—110 MW—Commissioning of this project hinges on the delivery of the equipment. M/s Heavy Electricals, Bhopal, would be in a position to supply this equipment only by 1970-71. This delivery requires considerable improvement if this project is to be completed within the Fourth Plan. The question as to the source of supply will require early decision.

(v) *Sharavathy (Stage III)*—178 MW—In this case also, the delivery of equipment will be deciding factor. HEL, Bhopal have indicated that they would be able to supply the generating equipment by 1970-71. This will need improvement. Early decision regarding source of supply should be made.

(vi) *Koyna (Stage III)*—160 MW—While the civil works are properly organised, delivery of generating equipment by HEL, Bhopal will determine the commissioning dates. No commitment has been made by HEL in this regard so far. Steel plates ordered on Rourkela need to be delivered expeditiously. Foreign exchange required for spare parts for construction equipment and for import of inevitable items of electrical and mechanical equipments, has also to be released early. Delivery of indigenous bull-dozers ordered on M/s. Bharat Earth Movers are also to be expedited. If equipment delivery is well timed, and the above action is taken, the project will go through during the Fourth Plan.

7.2.3 *Projects likely to spill over into the Fifth Plan (Thermal 950 MW) (Hydro 680 MW)*

Projects likely to spill over into the Fifth Plan and brief reasons for such apprehension are given below :—

A. *Thermal*

(i) Patratu Extn. (Stage II)—200 MW (2×100 MW) (BHEL)

Consultants not yet appointed. The construction on present stage of development is likely to continue upto the 4th quarter of 1969.

(ii) Cochin—55 MW (BHEL)
Not yet formally approved.

(iii) Amarkantak Extn. (Stage II)—110 MW (2×55 MW) (BHEL)
Project report not yet received.

(iv) Ennore Extn. (Stage II) (1×110 MW) (BHEL)
Not yet formally cleared.

(v) Faridabad—55 MW (BHEL)
Consultants not yet appointed.

(vi) Obra (Stage II)—200 MW (2×100 MW) (BHEL)
Consultants not yet appointed.

(vii) Badarpur (2nd unit)—100 MW (BHEL)
Delay in financial sanction is likely to push back the commissioning of the 2nd unit.

(viii) Chandrapura (Stage III) (2nd unit)—120 MW (HEL)
Not yet formally sanctioned.

B. *Hydro*

(i) *Vaitarana (contd.)*—60 MW(BHEL)—The pace of civil works need to be stepped up; funds allocated during the Fourth Plan are inadequate. The power plant can therefore be commissioned only in the subsequent plan when the requisite funds are provided.

(ii) *Balimela (contd.)*—60 MW—Very large amount of civil work is yet to be done and it is doubtful if this could be completed, unless a very great impetus is given to the tempo of civil works.

(iii) *U.B.D.C. (contd.)*—45 MW—The present progress of works leaves a lot to be still done during the rest of the plan period and this appears to be difficult to achieve.

(iv) *Yamuna II (contd.)*—60 MW—Based on the present progress, the volume of work still to be done is too large to be completed within the Fourth Plan.

(v) *Upper Sindh (New)*—22·5 MW—Based on the present progress, the volume of work still to be done is too large to be completed.

(vi) *Chenani Extn. (New)*—10 MW—Based on the present progress, the volume of works still to be done is too large to be completed within the Fourth Plan.

(vii) *Dhukwan (New)*—22·5 MW—Based on the present progress, the volume of works still to be completed is too large to be completed within the Fourth Plan.

(viii) *Lower Silent (New)*—100 MW—The civil works at site need to be speeded up considerably. Even then, the funds allocated to the project for the Fourth Plan are not adequate to complete the works.

7.3 It becomes evident that an aggregate capacity of 4·950 million kW of thermal units and 2·690 million kW of hydro units making a total of 7·740 million kW will be added during the Fourth Plan period. A total of about 1·7 million kW is marginal. With some efforts as indicated above, it should be possible to complete about 50% of this marginal capacity. This seems to be the upper limit of what can be achieved. The balance of about 2·5 million kW will spill into the Fifth Plan. The assessment of the Committee is based on the assumption that funds, both rupee and foreign exchange, are forthcoming as required to obtain the benefits.

7.4 Suggested steps for the Fourth Plan Power Schemes

7.4.1 The order of priority for the indigenous units being allocated to the projects should be firmly and finally fixed and the decision formally communicated to the concerned projects by Ministry of Irrigation & Power/CW&PC with an indication of the delivery programme.

7.4.2 The outlay of the Fourth Plan on Power Projects should be finally fixed and the Ministry of Irrigation & Power should ensure provision of adequate funds and foreign exchange for each project.

7.4.3 The detailed technical specification for the indigenous power units (Boiler and Steam turbo-generators or hydro units) should be finalised without further delay and formal orders placed on Indian factories so as to enable them to plan their manufacturing programme. This part of the work for thermal projects can be expedited if consultants are appointed very early, wherever necessary.

7.4.4 Foreign exchange for the balancing items should be tied up and the source communicated to the authorities concerned within the shortest possible time (maximum of 6/9 months) if some of the projects with indigenous units are to go through within the plan period. It has been brought to the notice of the Committee that CW&PC (Thermal Designs Organisation) have carried out a detailed study for the thermal projects and have submitted to Government an estimate of foreign exchange requirement. This could be the basis for initiating immediate action in the matter. This step is considered vital. Similar action should be taken immediately in respect of hydro projects also.

7.4.5 Bulk of the heavy movement over Indian Railways is likely to take place in the third and fourth years of the Plan. This demand will place heavy burden on railway authorities. Advance action for providing adequate numbers of suitable rolling stock to deal with the traffic without hold ups should be initiated. If Railways cannot provide them under their own budget, HEL and BHEL should arrange to procure their own wagons. For unloading at destination, railways should provide adequate numbers of heavy duty cranes.

7.4.6 One year of the Plan has already passed away. The pace of activity in project implementation requires to be accelerated and all out efforts made at all levels to achieve a greater measure of success than what has been indicated above.

7.4.7 Other recommendations regarding procurement procedures, co-ordination with control agencies, organisation etc., as already given in the preceding chapter will require due consideration.

7.4.8 It would be helpful if the Ministry of Irrigation & Power constitutes a small High Power Committee to review the progress on each project at suitable intervals with a view to remove bottlenecks that may exist or may arise.

8. GUIDELINES FOR FUTURE PLANNING

8.1 Planning is a continuous process and normally its benefit to accrue, should be spread our uniformly over the entire plan period. The average time schedule for thermal and hydro projects has been annexed to this report and this should give an indication as to the time when power schemes to be implemented in a succeeding plan should be formulated, finalised and approved for action. The investigation for a thermal power station at a new site should start about 6½ years in advance and that for a hydro scheme at least 8/10 years. This process for thermal schemes should now start for the Vth Plan to maintain the continuity of a uniform thermal power development. It appears that the Vth Plan hydro-electric programme will comprise the schemes already initiated in the Third Plan plus addition to some units at some of the hydro sites partially developed. Investigation on 62 projects totalling about 12 million kW initiated under the U.N. Special Fund should be accelerated for formulation of the Sixth and subsequent Plan schemes. Uneven distribution of projects over any plan period will result in benefits which are derived in spurts and consequently create an imbalance not only in power supply and demand but also in utilisation of manpower and other resources reflecting in delays and in increase in capital investment.

8.2 The country's hydro potential has been fairly accurately assessed. Conception of a Master Plan to be prepared by a central agency for harnessing the resources should be given the highest consideration. The magnitude of the task warrants a central agency to take up the work in right earnest supplementing the efforts being made at the State level. Similar steps for thermal projects should also be thought of to serve larger national interest, efficiently and economically. Close co-ordination with Atomic Energy Commission should be established to enable CW&PC to formulate national power programme.

8.3 Maximum utilisation of water resources at hydro sites in combination with appropriate loading of thermal and nuclear plants would offer the greatest possible economies in operation which is of great importance in any planning for power development. The former calls for careful consideration in fixing an economic scale of hydro generation, the benefit of which, should not be confined to one system only. In the light of inter-State EHV transmission lines for exchange of large blocks of power and of the prospects of nuclear plants being located at distant locations away from the sources of fossil fuels, hydro generation in future should be planned for optimum future peaking capacity; for similar consideration, pumped storage schemes should also be planned.

8.4 Emphasis on investigation has already been stressed. If, with a long range view, this part of the work is taken up in an orderly manner sufficiently in advance, it will enable an adequate number of economic projects being kept ready for implementation. The selection can then be made in a particular period to suit the power needs and the optimum utilisation of funds and other resources.

9. SUMMARY OF RECOMMENDATIONS

A summary of important recommendations of the Committee is given as follows :

9.1 Greater importance should be attached to adequate and comprehensive investigations in preparation of project reports. No project should be sanctioned unless all the relevant aspects have been duly investigated and the pre-requisites for implementation of the project have been met.

9.2 The proforma guideline as prepared by the Planning Commission for project reports should be reviewed and amended as necessary by Central Water & Power Commission to make it suitable for Thermal and Hydro projects and circulated to all State authorities

9.3 Work on investigation should be undertaken sufficiently in advance to ensure that the projects are fully investigated before they are considered for inclusion in any particular Plan.

9.4 For purposes of planning, the investigation work for a thermal project should be commenced at least 6½ years in advance of the target commissioning date; for hydro projects this should be commenced 8 to 10 years in advance.

9.5 Investigations of projects should be continuously carried out and adequate funds should be made available plan wise specifically for this purpose so that adequate number of economic projects can be kept ready for implementation at the time of formulating the Plan. The State authorities should arrange accordingly.

9.6 The investigation work for the Hydro scheme being much more extensive in nature should be placed under a senior engineer. In case of very large and inter-State projects a greater degree of collaboration between Centre and States is needed and the Central Government may take initiative in this matter.

9.7 A Master Plan for hydro and thermal projects on the basis of the total resources available in this country is to be worked out and it would be necessary for the CWPC to take initiative and maintain a close liaison with the States during investigation and preparation of Master Plans.

9.8 The time required for scrutiny and approving a project by the Technical Advisory Committee should be minimised. This will be achieved if the scheme has been fully investigated and adequate details furnished in the project report. The second reference to the Ministry of Finance for projects costing more than 5 crore rupees after they are cleared by Technical Advisory Committee could be obviated with advantage.

9.9 The foreign exchange sources should be firmly tied up for each project without a large time lag after the project has been formally approved. Foreign exchange for each approved project should be issued before implementation is taken up.

9.10 The purchase procedure should be streamlined. All purchase actions for the project should be taken directly by the Project Authorities/State Electricity Boards.

9.11 As soon as availability and source of foreign exchange have been formally confirmed and its release agreed to by the Ministry of Finance for any particular project for which advance intimation can be furnished to them, the Ministry of Irrigation & Power who should satisfy themselves as to the need and propriety of imports should have authority to release the foreign exchange without further reference to the Ministry of Finance.

9.12 Examination by DGTD from indigenous angle should be waived if:

(a) there is no tender from indigenous manufacturers,

(b) the price of indigenous equipment is higher than the landed cost of imported equipment plus 15% or such other percentages as may be fixed by the Government of India from time to time and the saving is substantial, and

(c) the delivery of indigenous equipment does not suit the project construction schedule.

9.13 The foreign exchange for replacement against loss in transit and/or transport damages should be promptly allotted by the Ministry of Finance against formal requests received from project authorities pending settlement with the Insurance Company.

9.14 Standardisation to the extent possible in the field of layout, civil design, auxiliary plant and common facilities should be fully explored.

9.15 The scheduling and programming for completion of the project should be carried out sufficiently in detail and in advance. For this purpose the programme evaluation and review technique (PERT) which clearly indicates inter-action of the various activities and their durations should be adopted as a rule by all project authorities.

9.16 Each project should own a limited number of construction plant and machinery to supplement the work of the contractor as found necessary in field construction.

9.17 A separate Planning Co-ordination and Progress Cell placed under the charge of a senior officer directly responsible to the head of the technical organisation should be created under each project. This cell should also have the services of a customs clearance and transport officer. The Planning and Progress Directorate under the CWPC should be appropriately equipped to watch and follow the progress of each project in greater details than hitherto and render active assistance in removing holdups at all stages of the project work.

9.18 The order of priority for the indigenous units being allocated to Fourth Plan projects should be firmly and finally fixed and the decision formally communicated to the concerned project authorities by Ministry of Irrigation & Power, Central Water & Power Commission.

9.19 The outlay of the Fourth Plan on power projects should be finally fixed and the Ministry of Irrigation & Power should ensure that adequate funds are provided for each project.

9.20 The detailed technical specification for the indigenous power units (boiler and steam turbo-generator or hydro units) should be finalised without further delay and formal orders placed on Indian factories so as to enable them to plan their manufacturing programme.

9.21 Foreign exchange for the balancing items should be tied up and the source communicated to the authorities concerned within a period not exceeding 6—9 months from date. For Fourth Plan thermal projects CWPC (SEOT) have already submitted details of foreign exchange requirement to Government. Similar action should be taken immediately in respect of hydro projects also.

9.22 Adequate provision for suitable rolling stock to move heavy traffic should be made by the Railways, HEL and BHEL. The railways should further provide for adequate number of mobile cranes of suitable capacity for unloading at destination.

9.23 The Ministry of I & P should constitute a small High Powered Committee to review the progress of each project at suitable intervals with a view to remove bottle-necks that may exist or may arise.

9.24 The planning for the 5th Plan in respect of Thermal, Nuclear and Hydro-schemes should be initiated forthwith.

9.25 Future hydro generation should be planned for optimum peaking capacity. Pump storage schemes for peaking duty should also be planned at appropriate locations.

9.26 A close scrutiny of the status of the projects included in any plan should be made before formulation of any Five Year Plan with a view to fixing a realistic target which would reasonably be expected to be achieved.

10. ACKNOWLEDGEMENT

The Committee would place on record its deep sense of appreciation for the assistance rendered and painstaking efforts made by engineers of the Specialised Engineering Organisation of the Central Water & Power Commission (Power Wing) in the collection, compilation and assessment of the performance data received from various authorities for the Third Plan projects. The Committee is also thankful to the Project Authorities who have co-operated by furnishing the project data under their control.

APPENDIX 1

No. 32(36)/66—EL.I

GOVERNMENT OF INDIA
MINISTRY OF IRRIGATION & POWER

New Delhi, 11th August, 1966

At the time of formulation of the Third Plan, target of 12·7 million kW of total installed capacity was intended to be achieved by the end of the Third Plan. During the mid-term appraisal, it was felt that it might be possible to achieve an installed capacity of about 11·5 million kW only. However, the actual installed capacity upto the end of the Third Plan has been only a little over 10 million kW. It has, therefore, become necessary to examine the reasons which have led to the shortfall and to devise measures so that the target for the Fourth Plan can be achieved in time. It has, accordingly, been decided to set up a Committee.

2. The Committee shall consist of the following :

1. Shri K. P. S. Nair, retired Vice-Chairman, CW & PC	Chairman
2. Shri B. C. Gangopadhyay, Director (FE&P), Ministry of I & P	Member
3. Shri K. M. Chinappa, General Manager, Tata Hydro-electric Power Supply Co. Ltd.	Member
4. Shri H. R. Rao, Joint Director (Power), Planning Commission	Member
5. Shri P. M. Mane, Chief Engineer, Koyna	Member
6. Shri A. K. Ghosh, Member (Thermal), CW & PC	Member-Secretary

3. The following will be the terms of reference of the Committee :

(a) to examine the reasons for delays in the implementation of thermal and hydro-electric projects in the Third Plan;

(b) to suggest measures :

(i) to accelerate work of planning, preparation of designs, construction of civil and ancillary works, erection, testing and commissioning of equipment, etc.,

(ii) to ensure timely procurement of materials and equipment—simplification of procedures thereof; and

(c) to indicate the extent of co-ordination required to be done by the Central Agencies, such as, CW&PC, Ministry of Irrigation & Power, etc.

4. The Committee shall submit its report within a period of three months.

5. The Committee shall have its headquarters at New Delhi.

Sd/- C. CHAKRABURTI
Deputy Secretary to the Government of India

APPENDIX 2

Descriptive Summary of Tabulated Project Performance Data

Trombay Thermal Station

This is a private sector project covering the installation of 1 × 150 MW turbo-generators as an extension of the existing thermal power station. It was not included in the original Third Plan Scheme prepared in September, 1961, but subsequently included for implementation in the Third Plan.

The initial planning of the project had begun in the second half of 1961 when some definite indication regarding availability of resources from the Development Loan Fund was given to the Project Authorities. The first step taken by Project Authorities was the appointment of consultant in September, 1961 with instructions to proceed immediately with the tender specifications for major equipment. This part of the work was partly completed even before a formal application for D.L.F. Loan was made in December, 1961.

The tenders for major equipment were issued in December, 1961 and the letter of intent placed on 13-6-1962 i.e. immediately after the source of foreign exchange was communicated on 5th June, 1962. Tenders for the balancing equipments were issued between April, 1962 and January, 1963 and the subsequent procurement action was taken as the project work progressed.

As this is an extension project adequate land for the extension was already available. Site investigation, however, commenced in July, 1962.

The preliminary civil works (site stores) for the project was taken up in August, 1962.

On 22-10-1962 the major civil works (pile driving in the boiler area) were taken up. The delivery of turbo-generator started in March, 1963 and after that the concrete work in T.G. foundation was taken up in April, 1963. The boiler equipment started arriving in June, 1963 and the boiler erection was taken up in September, 1963. The erection of turbo-generator was taken up in February, 1964.

The unit was commissioned in August, 1965, 33 months after the date of start of major civil works in October, 1962.

The other important dates in the progress of the project are :

1. Preparation of specification for Boiler & Aux.	22-9-61
2. Preparation of specification for Turbo-generator & Aux.	29-9-61
3. Authorisation of rupee expenditure by competent authority . . .	27-3-62
4. Start of concrete works in power station building	15-4-64
5. Completion of erection of Boiler	4-6-65
6. Completion of erection of turbo-generator	4-7-65

Satpura Thermal Station

Satpura Thermal Station, situated in Madhya Pradesh is one of the stations covered under the bulk purchase scheme. In this scheme which was initiated in September, 1961, 14 turbo-generators and some of the standard auxiliaries were procured against a bulk order and distributed to five stations. Originally two units of 62·5 MW were envisaged but later it was decided to install five units in this power station.

The project report was submitted in January, 1962 and sanction for starting work on this project was accorded after eight months on 13-9-1962. Consultants were appointed on 29-12-1962 and necessary land was also acquired in December, 1962.

Orders for the supply of the major equipment were placed between September, 1961 and April, 1963. Procurement action for the balance of the equipment designed to suit individual conditions was initiated in July, 1963.

Preliminary civil works (Railway siding) were started in September, 1963 and major civil works commenced in January, 1964. Boiler erection was taken up in April, 1964. The erection of other equipment was in progress upto the end of March, 1967.

According to the latest report the first unit is expected to be commissioned in June/July, 1967. The following are other important dates in the progress of the project :—

1. Issue of tenders for turbine under bulk purchase	18-9-61
2. Issue of letter of intent for boiler	20-7-62
3. Issue of letter of intent for turbine	7-12-62
4. Foreign exchange source for other equipment communicated	29-5-63
5. Formal approval by Planning Commission	3-10-63
6. Commencement of levelling, dressing etc.	12/63
7. Start of concreting of turbo-generator foundation	9/64
8. Turbine House crane erection	1/66
9. Erection of turbine commenced	7/66
10. Anticipated date of completion	June/July, 1967

Korba Thermal Station

The project report for Korba Thermal Power Station, in Madhya Pradesh, was submitted in April, 1960. Sanction for starting the project was accorded after twelve months on 15-4-1961. The project was posed for financing under the Rouble credit.

In March, 1962 detailed project report from U.S.S.R. was received. The project envisaged installation of three units of 50 MW each in Third Plan and a fourth unit of 50 MW capacity during Fourth Plan.

Preliminary civil works were started in April, 1962 and soon after the receipt of civil drawings in November, 1962, the major civil works were taken up.

Although erection of boilers was held over on account of delay in receipt of gantry crane, erection of equipment like water treatment plant was commenced in February, 1964. Eight months thereafter, boiler erection was taken up.

The first unit was commissioned in September, 1966. Other important dates in the progress of the project are :—

1. Authorisation of rupee expenditure	6/60
2. Site selection and start of land acquisition	11/60
3. Preparation of specification for boiler and turbine	3/62
4. Issue of letter of intent for boiler & turbine	8/62
5. Issue of import licence	10/62
6. Date of delivery of boiler & turbine	IV quarter '62
7. Date of commencement of erection	
Boiler (Unit No. 1)	2-7-64
Turbine House Crane	11/64
Turbine (Unit No. 1)	1/65
8. Date of completion of erection of	
Boiler (Unit No. 1)	4/66
Turbine (Unit No. 1)	8/66

Neyveli Thermal Station —Stage II

The project covers the addition of one 50 MW and one 100 MW units as an extension to the 250 MW station at Neyveli. This station is owned by the Neyveli Lignite Corporation. The project report for the extension was prepared in December, 1961 and sanction for starting the project was obtained after 13 months in January, 1963. The plant and equipment were supplied from U.S.S.R. and sanction for foreign exchange was given in October, 1963.

The 50 MW unit has to be located in an extension to the same building of the first stage. Major civil works for this unit were started in June, 1963; 15 months thereafter erection of auxiliary switchgear and electrical control which in the case of this unit preceded the erection of boiler, was taken up. The erection of equipment for this unit was completed and the unit was commissioned in August, 1965.

In case of 100 MW unit, the preliminary civil works in the form of clearing and levelling site were taken up in January, 1964 after about 12 months from the date of sanction for starting the project. In September, 1964, construction of major civil works in the form of fabrication of structures was taken up. In July, 1965, boiler erection was commenced. The erection of the equipment for the unit was completed in December, 1966.

Other important dates in the progress of the project are :—

	50 MW unit	100 MW unit
1. Authorisation of rupee expenditure	1/63	
2. Sanction for starting project	1/63	
3. Commencement of site preparation	1/64	
4. Commencement of equipment erection		
Auxiliary switchgear & control	9/64	
Boiler	11/64	9/65
Turbine	11/64	10/65
5. Pre-commissioning tests commenced	7/65	8/66

Kalakot Thermal Project

The Kalakot Thermal Station owned by J & K Minerals Ltd. (a public sector undertaking of J & K Government) is located in a hilly terrain near Kalakot coal-fields. The project report which was submitted in June, 1961 envisaged installation of 4×5 MW turbo-generators. Subsequently the scope of the project was revised to cover installation of 3×7·5 MW units. Sanction for starting the project was given in December, 1961.

Preliminary civil works for the project in the form of levelling were taken up in September, 1962. The contract for equipment was placed in January, 1963. Major civil works were commenced in December, 1963. Erection of mechanical equipment was taken up in June, 1965 and was in progress at the end of March, 1967. The first unit is expected to be commissioned in October/November, 1967 and the other two units are likely to be commissioned in February, 1968 and May, 1968 respectively. Other important dates in the progress of the project are :—

1. Departmental authorisation for starting project	9/62
2. Appointment of Consultant (Energoinvest)	9/62
Start of Civil Work	
Fabrication of structures	12/64

Tura Thermal Station

The project covers the installation of 2×2·5 MW Turbo-generators utilising coal from the Nangwal Bibra coal-fields. Although the sanction for starting the project was accorded as early as February, 1962, preliminary civil works like levelling and dressing of the site could only be taken up in February, 1964 due to the difficult terrain and lack of access roads. The construction equipments were delivered in March, 1964.

In December, 1964 major civil works were commenced. Tender for the plant and equipment of the station has been issued and from the delivery schedule it is inferred that mechanical erection could start in April, 1966. However, at the end of 1966 the erection of plant had not made sufficient progress to assess the probable date of commissioning. The following are other important dates in the progress of this project :—

1. Foreign exchange source communicated	1/62
2. Issue of tender (Turbine)	6/62
3. Issue of letter of intent for Turbine	12/62
4. Issue of tender (Boiler)	5/63
5. Issue of letter of intent for Boiler	9/63
6. Start of civil works	
Levelling, dressing etc.	2/64
Construction work in Turbo-generator foundation.	1/65
7. Delivery of equipment—Turbine	2/66

Chandrapura Thermal Station

This is a public sector project covering the installation of three units of 140 MW, one unit each in 1963/64, 1964/65 and 1965/66.

The sanction for starting project work on first unit was accorded in April, 1958. The Consultant for limited services was appointed in September, 1958. The selection of site was made in October, 1958 and land acquisition proceedings were initiated in January, 1959. Simultaneously, the tenders for boiler and turbine were issued in January, 1959. The site survey and soil investigation was commenced in the first quarter of 1959.

The preliminary civil works (levelling, dressing, railway siding and access road) for the project was taken up in December, 1959. The letter of intent for turbines was placed in May, 1960 and for boiler in September, 1960.

The major civil works (concrete works in power station building) were taken up in March, 1962.

The tenders for balancing equipment were issued between April, 1960 and January, 1962 (The tender for insulation was issued in December, 1962).

The erection of boiler was taken up first in May, 1962. The first unit was commissioned in October, 1964 and the second unit in May, 1965. The following are the dates in the progress of the project :—

1. Formal sanction of project by competent authority (1st unit)	4/58
2. Preparation of specification for boiler and turbine	11/58
3. Land acquisition	1/59
4. Formal approval by Planning Commission (IInd Unit)	12/59
5. Start of construction of access road	12/59
6. Submission of Project Report	1/60
7. Foreign exchange source communicated	6/60
8. Delivery of Turbine (complete)	3/62
9. Start of turbo-generator foundation	11/62
10. Delivery of Boiler (complete)	6/63
11. Start erection of T/H crane	6/63
12. Start erection of Turbine	10/63
13. Completion of boiler erection	8/64
14. Completion of turbine erection	9/64
15. Commissioning of second unit	5/65

Durgapur Projects Power Station

This is a public sector project covering the installation of 2 x 75 MW turbo-generators as an extension to the existing thermal power station of the Government of West Bengal. According to the original Third Plan Scheme one 75 MW unit was to be commissioned in 1963/64 and the other unit in 1964/65.

The project report for the extension was submitted in June, 1959 and the consultant was appointed in November, 1959. The preparation of specification was initiated departmentally before the appointment of consultant. Comprehensive global tender for complete major plant was issued in December, 1959. The project was agreed to in principle in October/November, 1959 and advance action was authorised in January, 1960. The letter of intent for the major equipment was issued in September, 1960.

On 8-8-1961 the major civil work (civil foundation for boiler) was taken up. The erection of boiler started in June, 1962. The first unit was put on continuous load on 5-4-1964 and the second unit on 31-7-1964. Other important dates in the progress of the project are :—

1. Preparation of specification of major equipment	10/59
2. Foreign exchange tie up	6/60
3. Second unit commissioned	7/64

Durgapur Extension (D.V.C.)

This is a public sector project covering installation of one unit of 140 MW as an extension of the existing thermal station. It was not included in the original Third Plan schemes but subsequently included for implementation within the Third Plan.

The Project Report was submitted in December, 1960 and a qualified sanction for starting work was accorded in May, 1961 with the proviso that no order should be placed until foreign exchange was tied up. The tenders for boiler and turbo-generator were issued departmentally by the Project Authorities in August, 1961. Consultant for limited services, was appointed in April, 1962.

The preliminary civil works (levelling, dressing etc.) for the project was taken up in June, 1963. The major civil works (concrete works in power station building) was taken up in April, 1964.

Tenders for major equipment were issued between August, 1961 and August, 1964 (some small items were ordered in 1965).

The delivery of boiler started in April, 1964 and the erection of boiler was taken up first in October, 1964.

Other important dates in the progress of the project are :—

1. Formal sanction of project by competent authority	11/61
2. Start soil investigation	11/62
3. Issue of letter of intent for turbine	1/63
4. Issue of letter of intent for boiler	2/63
5. Delivery of turbine started	3/65
6. Start erection of turbine	8/65
7. Commissioning of unit	12/66

Indraprastha Thermal Power Station Extension Project

This public sector project covers the installation of three units of 62·5 MW. In the original Third Plan Scheme prepared in September 1961, only two units of 60 MW were envisaged to be commissioned in 1965-66. The third unit was included later to be commissioned in the Third Plan. This project was covered in the Bulk Purchase Scheme.

The Project Report for the extension was submitted in May, 1961 and the authorisation to proceed with preliminary work was given in September, 1962. The formal sanction of the project by competent authority was accorded in June, 1963. The consultant was appointed in July, 1963.

The preliminary civil works in the form of site stores were taken up in March, 1964.

The tenders for major equipment were issued between March 1964 and October, 1964. Major civil works viz., piling of boiler area was taken up in March, 1964. The erection of boiler was taken up in October, 1964. The erection of the equipment is in progress and the station is likely to be commissioned by April, 1967. Other important dates in the progress of the project are :—

1. Issue of tenders for turbine	9/61
2. Issue of letter of intent for turbine	12/62
3. Foreign exchange source for the equipment communicated	8-3-63
4. Issue of letter of intent for boiler	30-3-63

Ramagundam Thermal Station Extension

This public sector project covers the installation of $1 \times 62 \cdot 5$ MW turbo-generator as an extension of the existing station. It was originally programmed for installation in 1964-65.

The project report for the extension was submitted in January, 1961 and the formal approval of Planning Commission was accorded in April, 1961. Immediately thereafter action for land acquisition was initiated in February, 1963. The foreign exchange source for their equipment was communicated in May, 1963 and the consultant was appointed in July, 1963. The station was included in Bulk Purchase Scheme in which the turbo-generator and some standard ancillary equipment was procured on a bulk order. The tenders for boiler were issued in November, 1963 and the other balancing equipment were issued between February, 1964 and April, 1966. Control and instrumentation specification is yet to be issued.

The preliminary civil works (levelling, dressing etc.) were taken up in June, 1964. It may be pointed out here that immediately after site selection in February, 1963, the project authorities started the work on natural draft cooling tower, a major civil work, in October, 1963. The letter of intent for a boiler was issued in March, 1965.

The major civil work (including the civil work of the cooling tower which was done earlier) in the form of turbo-generator foundation concrete work was taken up first in October, 1965.

The erection of boiler was taken up in July, 1966. The erection of equipment was in progress at the end of March, 1967. The station is likely to be commissioned in December, 1968.

Following are some of the important dates in the progress of the project :—

1. Authorisation of rupee expenditure	19-2-63
2. Formal sanction of project by competent authority	19-2-63
3. Preparation of specification (Boiler)	18-10-63
4. Indent of steel structure	5-10-64
5. Delivery of equipment (Boiler)	1-3-65
6. Delivery of steel structure	2/67

Obra Thermal Station

This public sector project covers the installation of 5×50 MW turbo-generators. In the original Third Plan Scheme prepared in September, 1961, it was programmed to install two units in 1964-65 and two more similar units in 1965-66. The fifth unit was envisaged to be installed in the Fourth Plan.

The supply of equipment for this project was negotiated with U.S.S.R. and correspondingly the foreign exchange source was already known to the project authorities, as early as January, 1960. The work of consultancy was also entrusted to U.S.S.R. authorities. The authorisation of rupee expenditure was accorded in March, 1960.

The site was selected in September, 1960 and the land acquisition was started in July, 1961. The preliminary civil works of levelling, dressing etc. was started in July, 1963.

The major civil works (concrete works in Power Station Building) was started in May, 1964. The erection of equipment (pre-assembly of boiler) was taken up thereafter in March, 1965. The erection of mechanical equipment is not yet complete.

Some of the other salient dates in the progress of the project are :—

1. Submission of detailed project report	1/63
2. Indent for reinforced steel	9/63
3. Commencement of erection (Boiler)	9/65
4. Turbine house crane	10/65
5. Formal approval by Planning Commission	10/65
6. Completion of erection—Turbine house crane	2/66
7. Commencement of erection—Turbine	4/66

Bandel Thermal Station

This public sector project covers the installation of 4×82·5 MW turbo-generators when the original Third Plan Scheme was prepared in September, 1961. It was programmed to install two units of 75 MW in 1964-65 and two more identical units in 1965-66.

The Project Report was submitted in July, 1960, and the consultant was appointed in August, 1960. The sanction for starting project work was accorded in December, 1960.

The tenders for boiler, turbine and other equipment were issued in March, 1961 and the letters of intent for boiler, turbine and other equipments were issued in September, 1961. Simultaneously, the work on land acquisition and site investigation was initiated in September, 1961. The departmental authorisation to proceed with the work was given in April, 1962.

The commencement date for site preparation is not indicated. The construction of temporary access road for purpose of starting work at site was taken up in May, 1962, and the work on the discharge tunnel was taken up at about the same time. It would appear that the Project Authorities preferred to await the final decision regarding foreign exchange before stepping up the pace of work. The foreign exchange was tied up in May, 1962.

The major civil work (piling) was taken up in June, 1962. The erection of boiler was taken up in May, 1963, after the delivery of boiler started at about the same time.

The first unit was commissioned in October, 1965. The following important dates reflect the progress of the project :—

1. Indent for steel structures	9-11-61
2. Delivery of steel structures	2-2-63
3. Commencement of erection of turbine house crane	8/63
4. Completion of erection of turbine house crane	12/63
5. Commencement of erection of turbine	12/63
6. Completion of erection of boiler	11/65

Dhuvaran Thermal Station

This is a public sector project envisaging the installation of 4×62·5 MW turbo-generators. In the original Third Plan Scheme it was programmed to install 1×60 MW unit in 63/64, 2×60 MW units in 1964/65 and 1×60 MW unit in 1965/66.

The Project Report was submitted in November, 1959, and the sanction for starting project work was accorded in February, 1960. The tenders for major equipment were issued in May, 1960. The foreign exchange source was communicated in July, 1960. The consultant was appointed in August, 1961.

The preliminary civil work (Railway siding) was started in December, 1960.

The major civil work in this project that was taken up was C.W. System in July, 1961. The delivery of boiler started in April, 1962.

The mechanical erection of the boiler was taken up in December, 1962.

The units have been commissioned as under :—

Unit I	1/65
Unit II	3/65
Unit III	5/65
Unit IV	8/65

Other important landmarks in the progress of the project are :—

1. Start site selection and land acquisition	6/59 & 2/60
2. Authorisation of rupee expenditure	4-5-60
3. Issue of tenders (Boiler & Turbine)	5/60
4. Issue of letter of intent (Boiler & Turbine)	10/60
5. Commencement of erection (Turbine)	1/63
6. Completion of erection (Turbine & Boiler)	2/65

Talcher Thermal Power Station

This public sector project covers the installation of $4 \times 62 \cdot 5$ MW turbo-generators. In the original Third Plan programme prepared in September, 1961 only three units of 60 MW were envisaged to be commissioned by the Third Plan—one unit in 1964/65 and two more identical units in 1965-66. The fourth unit was scheduled to be commissioned in the Fourth Plan.

The Project Report was submitted in April, 1960 and the sanction for starting project work was accorded in January, 1961. The foreign exchange source was communicated in August, 1961 and shortly afterwards in October, 1961 the consultant was appointed. The major equipment like Turbo-generator, B.F. Pump, Feed water heaters, Deaerators were procured under Bulk Purchase Scheme of Government of India. The tender for the balancing equipment were issued between December, 1962 and August, 1964. The letter of intent for boiler was issued in February, 1963.

The preliminary civil work (Railway siding) was taken up in March, 1963.

The major civil works in the form of concrete works in turbo-generator foundation was taken up first in November, 1963.

The turbine house crane was erected in June, 1964. The erection of boiler started in August, 1964 and is still in progress. The delivery of turbine was made in May, 1964 and the erection of turbine was started in July, 1965 and is still in progress. The station is likely to be commissioned in July, 1967.

Patratu Thermal Station

The proposal for installation of two units of 50 MW at Patratu was approved by Planning Commission in January, 1960, following which a project report embodying the same was submitted in April, 1961. It was subsequently changed to include five units of 50 MW each in January, 1962. A delegation of Government of India visited U.S.S.R. in March, 1962 to finalise the details. Subsequently the project was further revised according to which four sets of 50 MW and two sets of 100 MW are to be installed at Patratu. Contract for supply of equipment was signed in September, 1962. Land acquisition was initiated in 1958 and was done in phases and completed in 1963.

Levelling and dressing was commenced in December, 1961, and major civil works were taken up in March, 1963. Mechanical erection was started in May, 1964 and the first unit was commissioned in June, 1966. Other salient dates in the implementation of the project are :—

1. Start of civil works (Railway siding)	1/62
2. Start of civil works (Access roads)	8/62
3. Start of civil works (coal handling)	4/63
4. Start of civil works (concrete in turbo-generator foundation)	5/63
5. Start of civil works (fabrication of steel structures)	11/63
6. Date of commencement of erection (Turbine house crane)	8/64
7. Date of commencement of erection (Turbine)	5/65
8. Formal approval by Planning Commission	7-12-65
9. Date of completion of erection (Boiler)	12/65
10. Date of completion of erection (Turbine)	2/66
11. Pre-commissioning tests (Start)	23-3-66

Sharavathy Hydro-Electric Project—Stage I

The Project covers the installation of two units of 89·1 MW. In the original Third Plan Scheme prepared in September, 1961 it was programmed that one unit each to be commissioned in 1962/63 and 1963/64.

The investigation of the project was started in 1952 and the Project Report was submitted on 25-10-1954. The formal approval of the Planning Commission for the starting of the project work was accorded in June, 1956 and the departmental sanction by competent authorities was accorded in July, 1956. No consultant was appointed.

The preliminary civil works (access roads, colonies etc.) for the project was taken up in early 1956.

The major civil works on the dam was taken up in 1958. The foreign exchange for civil engineering works were tied up in 1958 and electrical equipment in June, 1960. The equipment were ordered between March, 1960 and October, 1962. Some small items were ordered between February, 1963 and December, 1965.

The major civil works on power station was taken up in March, 1961. The concreting of turbo-generator foundation was taken up in 1961.

The erection of turbo-generator was taken up in May, 1963.

The first unit has been commissioned in January, 1965 and the second unit in April, 1965.

Sharavathy Hydro-Electric Project—Stage II

The project covers the installation of four units of 89·1 MW. In the original Third Plan Scheme prepared in September 1961, it was programmed that two units each to be commissioned in 1964-65 and 1965-66.

The project is not complete yet and the data submitted by the project authorities are insufficient to make analytical study.

Jaldhaka Hydro-Electric Project

The project covers the installation of 2×9 MW hydro generators. In the original Third Plan Scheme it was scheduled to be commissioned in 1963-64.

The project appointed consultants in early, 1957 and the preliminary investigation like geological survey for tunnel, water conducting system, land acquisition etc. were completed between 1957 and 1960. The project was sanctioned in May, 1959. The preliminary civil works in the form of colony and staff quarters were taken up in 1960.

In 1960, the civil work on water conduction system was also taken up and in 1962 the work of concrete work in power station was taken up.

In 1964, the erection of turbo-generator was taken up but in July, 1964 a devasting flood damaged the power house and necessitated some radical changes in the design and layout. The station is not yet complete.

Other significant dates in the progress of the project are :—

1. Project sanction by Planning Commission	5/59
2. Start erection power house crane	1964
3. Complete erection power house crane	1965

Rana Pratap Sagar Power Station

The project covers the installation of 4×32 MW hydro-generators of which one 32 MW unit was originally programmed for installation in 1964-65 and three more similar units in 1965-66.

The investigation of the project was started in 1948 and the Project Report was submitted in 1958. In 1958 itself authorisation for advance action was authorised by Planning Commission.

The preliminary civil works (colony, staff quarters, site stores etc.) were taken up some time in January, 1961. The access road was already existing as it had been completed in the first stage of Chambal Valley Development.

Simultaneously, with the preliminary civil works, the major civil work for the dam (excavation work in dam site) was taken up. The formal sanction of the project by the competent authority was obtained in February, 1961 and after that the concrete work in dam was taken up in December, 1961.

The indent for the major portion of the equipment were placed with DGS&D between April, 1962 and November, 1962. The consultant was appointed in October, 1963 and the foreign exchange source was communicated in December, 1963. The delivery of turbo-generator started in March, 1964. The indents for the balancing equipment (power and control cables, gantry cranes) were placed in the middle of 1966 and their delivery is yet to start.

Other important dates in the progress of the project are :—

1. Excavation work in dam site	1/61
2. Erection of crane	9/65
3. Concrete works in power station building	10/65
4. Start turbo-generator foundation	10/65
5. Erection of turbo-generator	12/65

Uhl Hydro-Electric Scheme Extension

In the original Third Plan Scheme prepared in September, 1961, it was programmed to install a 40 MW hydro station in 1964-65. This was, however, subsequently changed at a later date to 3×15 MW hydro-generating units to be completed within Third Plan period.

The Project Report was submitted in August, 1960 and the departmental sanction for starting project work was accorded in January, 1961 earlier than the approval of Planning Commission which was given in May, 1961. No Consultant was appointed and the preparation of designs and specifications for the civil, hydraulic, mechanical and electrical works was done departmentally.

The land acquisition was started in January, 1961 and the project investigations were started between April, 1961 and August, 1961. This was an extension project and as such construction of major civil work of dam was not involved. Procurement action in the form of issuing letters of intent for major equipment had been taken between February, 1963 and September, 1965.

The preliminary civil works in the form of construction of site stores was started in July 1961.

Subsequent to the taking up of the project the following major changes in the scope of the project have been made:—

(i) Increase in installed capacity to 3×15 MW.

(ii) Increase in capacity of power flume from 600 CS to 900 CS.

(iii) Conversion of major length of open flume to tunnels and covered flume.

(iv) Shift of the location of power house from left side to the right side of nallah on account of geological reasons.

(v) Alignment of penstocks and location of anchor blocks had to be altered for geological reasons.

The departmental sanction for the revised expenditure on account of the change in the scope of project was accorded in December, 1965.

From the replies to the questionnaire it is not very clear when the major civil works started. However, little headway has been made in this regard as it appears that the first stage of hydro-generator foundation only has been completed and the concrete works in the power station building are yet to be completed.

Bhakra Right Bank Power Project

In the original Third Plan Scheme prepared in September, 1961 it was envisaged to install hydro-generators of 1×70 MW in 1964/65 and 3×70 MW in 1965-66. This was, however, subsequently changed and in its place the installation of 4×120 MW hydro generators were decided upon. Of these four units, the installation of 2×120 MW was programmed to be completed by the Third Plan.

The Project Report was submitted in May, 1960 and the sanction for starting project work was accorded in July, 1961. No consultant was appointed. The foreign exchange source was tied up in February, 1961.

The preliminary site investigation had already been completed before taking up the work of construction of Right Bank Power Plant alongwith similar part of the work for Bhakra Dam and Left Bank Power Plant. Similarly preliminary civil works such as access roads, colony, staff quarters as well as some major civil works for the dam and water conduction system were not necessary as they had already been done during the construction of Bhakra Dam and the Left Bank Power Plant.

The complete power plant and switchyard equipment were procured under Rouble Credit from U.S.S.R. The specifications were issued some time in the beginning of 1963 and the delivery of equipment started in the 3rd and 4th quarters of 1964. The major civil works for the power station (concrete works in power station building) were taken up in January, 1963. The erection of electrical equipment (Switchyard) was taken up first in July, 1964. The erection of hydro-generator and crane was taken up in December, 1964.

The first unit was completed in May, 1966. The second unit is not yet complete.

Koyna Hydro-Electric Project—Stage I

The project covers the installation of 4×60 MW hydro-generators. In the original Third Plan Scheme, it was programmed to install two units of 60 MW in 1961-62 and two more units in 1962-63.

The investigation of the project was started in 1947 and the Project Report was submitted in December, 1952. The administrative sanction for starting project work was accorded in February, 1953.

The preliminary works on access roads, colony, store etc. commenced in 1954.

The major civil works of excavation of dam was started in November, 1954. At the same time work of design of the main elements of work and preparation of specification and tender papers was in progress. The consultant was appointed in February, 1955. Tenders for works like dam, head race tunnel, ventilation and approach tunnel of power house were decided in March, 1956

The work of power house proper commenced in April, 1957.

The mechanical erection in power house was started in the form of power house crane in September, 1959. The erection of turbo-generators (1st unit) were started in February, 1960 and completed in July, 1961. The four units were commissioned in May 1962, September 1962 and February 1963 respectively.

Koyna Hydro-Electric Project—Stage II

The project covers the installation of 4×75 MW turbo-generators. In the original Third Plan Scheme prepared in September, 1961, it was programmed to install 1×75 MW in 1964/65 and 2×75 MW in 1965-66. The fourth 75 MW was programmed to be installed in the Fourth Plan.

The Project Report was submitted in July, 1960 and the administrative approval was accorded in July, 1962.

This project being an extension of Stage I, no additional investigation was necessary. Similarly, preliminary civil works like access roads, colonies, stores and major civil works like head race and tail race tunnels were not necessary as these were completed in the first stage. The dam work was continued to a section corresponding to storage included in Stage II development.

The major civil works in the form of excavation of pressure shafts was started in June, 1961. The tender for the major equipments were finalised in June, 1962. The concreting of turbo-generator foundation was started in May, 1963. The Consultant was appointed in March, 1964.

The three units have been commissioned on 4/66, 6/66 and 11/66. The fourth unit is not yet commissioned.

Sholayar Hydro-Electric Project

The project covers the installation of 3×18 MW. In the original Third Plan Scheme it was programmed to install all the three units in 1963-64.

The investigation of the project was started in 1956-57 and simultaneously work of preliminary civil works in the form of access road was also taken up in 1956-57. The construction of staff colony was started in 1957-58. The formal approval of Planning Commission was accorded in March, 1959. No Consultant was appointed. The issue of tender for major power plant equipment was made in December, 1959.

The departmental sanction was accorded in January, 1960 and immediately thereafter, in February, 1960 the major civil works of the construction of coffer dam was taken up.

The foreign exchange source was communicated in February, 1961 and alongwith it the sanction for the purchase of turbine and generator was accorded by the Government of India.

The concrete work in power station building was taken up in September, 1962.

The erection of power house crane was started in May, 1964 and completed in March, 1965. Thereafter, the erection of turbo-generator started in July, 1965.

Sabarigiri Hydro-Electric Project

The project covers the installation of 6×50 MW hydro-generators. In the original Third Plan Scheme prepared in September, 1961 it was programmed to install 2×50 MW in 1964-65 and 3×50 MW in 1965-66. The sixth 50 MW unit was programmed to be installed in the Fourth Plan.

The project was formulated in July, 1959 and the investigations were completed near about July, 1960. The Project Report was submitted in November, 1959 and the authorisation of advance action by Planning Commission was accorded in 1960-61. The formal approval of Planning Commission was accorded in August, 1960. The departmental administrative sanction was obtained in February, 1961.

It is not clear from the replies to the questionnaire by the Project Authorities when the action on preliminary civil works was initiated. The major civil works for the Power House and Dam however have presumably been initiated in July, 1961 and November, 1961 respectively.

The foreign exchange source was communicated in July, 1962. The consultant was appointed in September, 1962.

The dates of initiation of activities of other major civil works as well as the procurement action and erection activity are not furnished in the reply to the questionnaire. The commissioning dates of the units are as follows :—

Unit 1	4/66
Unit 2	6/66
Unit 3	12/66

APPENDIX 3

Questionnaire for Thermal Projects

STATEMENT SHOWING THE TIME TAKEN FOR VARIOUS STEPS FOR THE IMPLEMENTATION OF THERMAL POWER PROJECTS IN THIRD FIVE YEAR PLAN

1.	Name of Project				
2.	(*a*) Proposed installed plant capacity and target for completion as per Project Report.				
	(*b*) Original Project Estimate (amount in Rs.)				
3.	*Progress at the end of Third Five Year Plan :*				
3.1	Capacity commissioned				
3.2	Percentage of work completed				
4.	*Project Clearance :*				
4.1	Date of submission of Project Report				
4.2	Whether advance action was authorised by Planning Commission and date thereof.				
4.3	Date of formal approval by the Planning Commission				
5.	*Finance Clearance :*				
5.1	Date of authorisation of Rupee expenditure by competent authority.				
5.2	When was foreign exchange source communicated?				
5.3	Date of formal sanction of the project by competent authority.				
6.	*Organisation :*				
6.1	Agency for execution. Head of the organisation and date of appointment thereof.				
6.2	Agency for civil works and if independent of above				
6.3	Date of appointment of consultant, if any				

		Date of commencement		Date of completion	
		Target and date of fixing target	Actual	Target and date of fixing target	Actual
7.	*Project Investigations :*				
7.1	Selection of site and land acquisition				
7.2	Site surveys and soil investigation				
7.3	Water supply arrangements				
7.4	Ascess road and railway facilities				
7.5	Coal availability and transport and ash disposal arrangements.				

8.	*Additions and Alterations :*			
8.1	Extent of major change in the scope of shape of the project beyond that cleared by Planning Commission.			
8.2	Extent of revision in Project Estimate as a result of above and/or statutory changes.			
8.3	Time required to obtain sanction of competent authority for additional expenditure.			

		Date of Indent	Anticipated date of delivery	Actual date of delivery
9.	*Procurement of Construction Materials :*			
9.1	Steel for structures, bunkers, tanks etc.			
9.2	Reinforcement steel			

		Date of Indent	Anticipated date of delivery	Actual date of delivery
9.3	Cement			
9.4	Other critical materials			

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Appendix 3—*contd.*

10.	*Procurement of Equipments :*	For Information required please *see* Annexure 'A'
10.1	Construction machinery	
10.2	Turbo-generator and auxiliaries	
10.3	Boiler and auxiliaries	
10.4	Step up station equipment	
10.5	Coal handling system	
10.6	Water Treatment plant	
10.7	Power house crane	
10.8	Power Station switch and control gear	
10.9	Power Station piping	
10.10	Other electrical equipments including power and control cables.	
11.	*Landing & Clearing :*	
11.1	Agency for landing, clearing through customs and despatch to site.	
11.2	Shortest and longest time required to clear major consignments.	
11.3	Agency for checking stores at site and settling claim cases.	
11.4	Shortest and longest time required to obtain foreign exchange release for replacements.	

12. *Civil Works :*

	Date of invitation of tender for major civil works		Date of award of contract for major civil works		Date of commencement		Date of completion	
	Target	Actual	Target	Actual	Target	Actual	Target	Actual
12.1 Levelling, dressing & storm water drainage								
12.2 Site Stores								
12.3 Access Roads								
12.4 Railway siding								
12.5 Concrete works in power station building								
12.6 Concrete works for turbo-generator foundation								
12.7 Fabrication of structures								
12.8 Erection of super structures and construction of roof								
12.9 C.W. System								
12.10 Cooling tower, if any								
12.11 Coal and ash handling system								

Appendix 3—*contd.*

13. *Design & Erection of Plant & Equipment :*	Date of receipt of necessary information and drawings from manufacturer of major equipment to commence works on civil construction drawings		Date of release of working drawings by consultant		Erection of Equipment			
					Date of commencement		Date of completion	
	Target	Actual	Target	Actual	Target	Actual	Target	Actual
13.1 Boiler								
13.2 Turbo-generator								
13.3 Boiler auxiliary equipment								
13.4 Turbine auxiliary equipment								
13.5 Power station piping								
13.6 Control instrumentation (Thermal)								
13.7 Turbine house crane								
13.8 Auxiliary switchgear and electrical controls								
13.9 Step up station								
13.10 Coal handling system								
13.11 Water treatment plant								
13.12 Fuel oil plant								
13.13 Power station cabling								

14. *Commissioning :*	Date of indent	Anticipated date of delivery	Actual date of delivery
14.1 Procurement of oils, lubricants, consumable and other stores.			

14.2 Precommissioning Tests	Date of commencement		Date of completion	
	Target	Actual	Target	Actual

15. *Periods of Holdups (in weeks) :*

15.1 Due to additional investigations required

15.2 Due to non-availability of scarce materials such as detonators, explosives etc.

15.3 Due to delays in receipt of construction materials

15.4 Due to delays in construction drawings

15.5 Due to changes in foundation arising out of inadequate investigation.

15.6 Due to change in scope of works envisaged in the project.

15.7 Due to delays in obtaining sanctions from competent authority for the resultant increase in estimate due to increased scope of work.

15.8 Due to delay in shipment of plant & equipment

15.9 Due to landing, clearing and despatch

Due to delay in receipt of erection equipment

Appendix 3—*concld.*

15.11	Due to procedural delays in procurement					
15.12	Due to labour strikes and lockouts					
15.13	Delay in achieving engineering co-ordination between different sections of plant reflecting in delay in delivery.					
15.14	Due to any other unforeseen reasons					
16.	*Construction Schedule & Fund Allotment :*					
16.1	Target construction schedule and revision thereof This may be shown in a bar chart listing major items.					
16.2	Fund required to meet the target construction schedule year to year.	1961-62	1962-63	1963-64	1964-65	1965-66
16.3	Fund allotted yearwise					
16.4	Actual expenditure yearwise					

APPENDIX 4

Questionnaire for Hydro Projects

STATEMENT SHOWING TIME TAKEN FOR VARIOUS STEPS FOR THE IMPLEMENTATION OF HYDRO-ELECTRIC POWER PROJECTS IN THIRD FIVE YEAR PLAN

1. *Name of Project :*

1.1 Type of project i.e. single purpose or multi-purpose

1.2 Inter-State or single State

2. *Proposed Installed Plant Capacity and Target for Completion as per Project Report :*

2.1 Original project estimate (amount in Rs.)

3. *Progress at the End of Third Five Year Plan :*

3.1 Capacity commissioned

3.2 Percentage of work completed

3.2.1 Dam

3.2.2 Water Conductor System

3.2.3 Power House

4. *Project Clearance :*

4.1 Date of submission of Project Report

4.2 Whether advance action was authorised by Planning Commission and date thereof.

4.3 Date of formal approval by the Planning Commission

5. *Financial Clearance :*

5.1 Date of authorisation of Rupee expenditure by competent authority.

5.2 When was foreign exchange source communicated?

5.3 Date of formal sanction of the Project by competent authority.

6. *Organisation :*

6.1 Agency for execution. Head of the organisation and date of appointment thereof.

6.2 Agency for execution of power station and if independent of above.

6.3 Date of appointment of Consultant, if any

6.4 Which agency prepared the designs and specifications for the civil, hydraulic, mechanical and electrical works?

7. *Project Investigations :*

	Date of commencement		Date of completion	
	Target and date of fixing target	Actual	Target and date of fixing target	Actual
7.1 Selection of Dam Site				
7.2 Selection of Power Station Site				
7.3 Geological Survey for Dam				

Appendix 4—*contd.*

		Date of commencement		Date of completion	
		Target and date of fixing target	Actual	Target and date of fixing target	Actual
7.4	Geological Survey for Tunnel				
7.5	Site Surveys and soil investigation				
7.6	Fixation of height of dam				
7.7	Water conductor system				
7.8	Land acquisition				
7.9	Diversion and dewatering				
7.10	Availability of construction materials nearby				
7.11	Access roads and railway facilities				
8.	*Additions and Alterations :*				
8.1	Extent of major changes in the scope of the project beyond that cleared by Planning Commission.				
8.2	Major revision in design/additional works required due to difficulties encountered subsequent to taking up work (e.g. geological difficulties, higher flood discharges, material difficulties, construction equipment difficulties etc.)				
8.3	Extent of revision in Project estimate as a result of above and/or statutory changes.				
8.4	Time required to obtain sanction of competent authority for additional expenditure.				

		Date of Indent	Anticipated date of delivery	Actual date of delivery
9.	*Procurement of Construction Materials :*			
9.1	Steel for structures, penstocks, trash racks, gates etc.			
9.2	Reinforcement steel			
9.3	Cement			
9.4	Other critical materials			
10.	*Procurement of Equipments :*	For information required please *see* Annexure 'A'.		
10.1	Construction machinery			
10.2	Conveying equipment e.g. conveyor belts, ropeways etc.			
10.3	Chilling Plant			
10.4	Generating plant and auxiliaries			
10.5	Mechanical equipment—Gates, hoists etc.			
10.6	Water control system			
10.7	Power house crane, gantry cranes			
10.8	Power station switchgear & controls			
10.9	Step up station equipment			
10.10	Other electrical equipment including power and control cables.			
10.11	Construction power plant (if any)			
11.	*Landing & Clearing :*			
11.1	Agency for landing, clearing through customs and despatch to site.			
11.2	Shortest & longest time required to clear major consignments.			

Appendix 4—*contd.*

11.3 Agency for checking stores at site and settling claim cases.

11.4 Shortest and longest time required to obtain foreign exchange release for replacement.

		Date of invitation of tender for major civil works		Date of award of contract for major civil works		Date of commencement		Date of completion	
12.	*Civil Works :*	Target	Actual	Target	Actual	Target	Actual	Target	Actual
12.1	Access Road								
12.2	Colony and staff quarters								
12.3	Railway siding								
12.4	Diversion Tunnel								
12.5	Coffer Dam								
12.6	Levelling								
12.7	Site stores								
12.8	Concrete work for construction power station								
12.9	Excavation works in Dam Site								
12.10	Concrete works in Dam								
12.11	Concrete works in power station building								
12.12	Concrete works for turbo-generator foundations								
12.13	Fabrication of structures								
12.14	Erection of super-structures								
12.15	Construction of channel, surge tanks etc.								
12.16	Water conductor system								

		Start	Complete
13.	*Date of Starting and Completing Each Major Part of Project work :*		
13.1	Dam		
13.2	Tunnel		
13.3	Channels		
13.4	Surge tank		
13.5	Power House Crane		
13.6	Turbo-Generator		
13.7	Switchyard		

		Date of Indent	Anticipated date of delivery	Actual date of delivery
14.	*Commissioning :*			
14.1	Procurement of oils, lubricants, consumable and other stores.			
14.2	Precommissioning tests			

		Date of commencement		Date of completion	
15.	*Periods of Holdups (in weeks) :*	Target	Actual	Target	Actual
15.1	Due to delay in additional investigations required				
15.2	Due to non-availability of scarce materials such as detonators, explosives etc.				
15.3	Due to non-availability of skilled personnel				

Appendix 4—*concld.*

15.4	Due to delay in deciding the dam site in consultation with Geological Department.					
15.5	Due to lack of inter-State agreement					
15.6	Due to delays in construction drawings					
15.7	Due to changes in foundation arising out of inadequate investigation.					
15.8	Due to change in scope/design of works envisaged in the project.					
15.9	Due to delays in obtaining sanctions from the competent authority for the resultant increase in estimate due to increased scope of work.					
15.10	Due to delay in shipment of plant & equipment					
15.11	Due to delays in landing, clearing and despatch					
15.12	Due to delay in procurement of construction equipment for major civil works.					
15.13	Due to procedural delays in procurement					
15.14	Due to labour strikes and lockouts					
15.15	Due to delay in achieving engineering coordination between sections of plant reflecting in delay in delivery.					
15.16	Due to dewatering and diversion problems					
15.17	Due to non-availability of suitable contractor for undertaking tunnel work.					
15.18	Due to want of timely help and guidance from Geological Department for tunnel work.					
15.19	Due to want of suitable workshop for fabrication of penstocks, gates and hoists.					
15.20	Due to delay in receipt of erection equipment (Mechanical & Electrical), lack of erection equipment and trained labour.					
15.21	Due to legal proceedings such as injunction etc.					
15.22	Due to any other unforeseen reasons					
16.	*Construction Schedule and Fund Allotment :*					
16.1	Target construction schedule and revision thereof. This may be shown in a bar chart listing major items.					
16.2	Fund required to meet the target construction schedule year to year.	1961-62	1962-63	1963-64	1964-65	1965-66
16.3	Fund allotted yearwise					
16.4	Actual expenditure yearwise					

APPENDIX 5

List of Projects Taken up for Investigation of Shortfall

Sl. No.	Name of Project	Type	Location	Installed Capacity* MW
1	Ramagundam	Thermal	Andhra	60
2	Upper Sileru	Hydro	Do.	120
3	Tura	Thermal	Assam	5
4	Pathrathu	Thermal	Bihar	300
5	Ahmedabad	Thermal	Gujarat	60
6	Dhuvaran I	Thermal	Do.	250
7	Kalakote	Thermal	J. & K.	22.5
8	Sholayar	Hydro	Kerala	54
9	Sabarigiri (Pamba)	Hydro	Do.	250
10	Korba	Thermal	Madhya Pradesh	150
11	Satpura	Thermal	Do.	210
12	Kundah I & II	Hydro	Madras	38
13	Kundah III	Hydro	Do.	245
14	Neyveli	Thermal	Do.	400
15	Koyna I	Hydro	Maharashtra	240
16	Koyna II	Hydro	Do.	225
17	Bhusawal	Thermal	Do.	60
18	Trombay	Thermal	Do.	150
19	Tarapore	Nuclear	Do.	150
20	Saravathy I	Hydro	Mysore	178·2
21	Saravathy II	Hydro	Do.	356·4
22	Talcher	Thermal	Orissa	180
23	Bhakra Right Bank	Hydro	Punjab	280
24	UHL Stage II	Hydro	Do.	40
25	Rana Pratap Sagar	Hydro	Rajasthan	172
26	Matatila	Hydro	Uttar Pradesh	20
27	Obra I	Thermal	Do.	200
28	Jaldhaka	Hydro	W. Bengal	18
29	Durgapur Project West Bengal	Thermal	Do.	150
30	Bandel	Thermal	Do.	330
31	Chandrapura	Thermal	D.V.C.	280
32	Durgapur Extension	Thermal	Do.	140
33	Indraprastha	Thermal	Delhi	187·5

*This was the target for commissioning in the Third Plan.

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APPENDIX

Compilation of Data for

S. No.	Particulars	Trombay	Satpura	Korba	Neyveli	Kalakote	Garo Hills	Chandrapura
1	*Project Estimate Details*							
	(i) Installed plant capacity (MW)	150	5 × 50/60	200	400	20	5 (2 × 2·5)	280 (2 × 140)
	(ii) Target for completion	June 1965	Unit I 12/63 Unit II 6/65 Unit III 6/65 Unit IV 6/65 Unit V 6/65	The project report did not specify any particular data	Aug. '66	End of '64	'68	Unit I June/July '64 Unit II Oct./Nov. '64
	(iii) Project Estimate (in Rs. lakhs)	1250	2730·53	1860	1850 (Gross) 1803 (Net)	256	64·49 (O) 191 (R) Generation 36·40 (Transmission)	2885 (Revised 2843)
2	*Progress*							
	(i) Capacity commissioned (MW)	150	Nil	Nil	50 + 250 = 300	Nil	Yet to be commissioned	210
	(ii) Percentage of work completed	100%	34·33%	E&M C I. 80% 100% II. 60% 80% III 2·% 60% IV — 50%	73%	Civil = 80% Erection = 5%	31%	100%
3	*Project Clearance*							
	(i) Date of submission of project report	Application for DLF in Dec. '61	2-1-62	4/60	Preliminary 12/61, Detailed 10/63	The project report was prepared by CW&PC in July '62.	July '66 (Revised)	Project report—8/60. Project appraisal report Jan. '60.
	(ii) Advance action authorised by Planning Commission	..	Yes 13-9-62	None	1/63	Probably Yes	..	No
	(iii) Date of formal approval by Planning Commission	..	3-10-63	15-4-61		12/61	..	I Unit - 4/58 II Unit- 12/59
4	*Financial Clearance*							
	(i) Date of authorisation of Rupee expenditure	27·3 62	13-9-62 (for advance action)	6/60	1/63	Not Known	1963	1958-59
	(ii) F.E. source communicated	5·6 62	29-5-63		2/60 Source is from USSR	18-10-62 28-5-63 (R) 12-3-66 (R)	Jan. '62	DLF loan was executed in June '60
	(iii) Formal sanction of the project	26-6-62	3-10-63	15-4-61	..	Board approved in Sept. '62	Revised project report submitted to CW&PC.	I unit—4/58 II unit—12/59
5	*Organisation*							
	(i) Agency for execution	Design & Construction by Tata Ele. Co.	MPSEB	MPSEB & Larson & Toubro	Neyveli Lignite Corp.	J&K Minerals Ltd.	SE, ASEB	DVC
	(ii) Agency for Civil work	No independent agency	MPSEB	MPSEB	N.L.C.	J&K Minerals Ltd.	ASEB	Civil works for concrete stack was contracted separately
	(iii) Date of appointment of consultant	5-9-61 Ebasco Service Inc. New York.	29-12-62	20-10-62	CW&PC in respect of design and technical aspects of equipment	16-5-61 CW & PC 9-9-62 Engineer	No consultant appointed	Gibbs & Hills Unit I - 9/58 revised including II unit - 5/61

Thermal Power Stations

Durgapur (WB)	Durgapur (DVC)	Indra-prastha	Rama-gundam	Obra	Bandel	Dhuvaran	Talcher	Patratu	Remarks
2×75	140	3×62·5	60	5×50	4×82·5	254	250	Proposed 4×50 MW 2×100 MW	
End of Third Five Year Plan	June 66	Unit 2 7/65 Unit 3—9/65 Unit 4—11/65	1963/64	Unit I-12/65 Unit II-3/66 Unit III-6/66 Unit IV-9/66 Unit V-12/66	Unit I-1/66 Unit II-2/66 Unit III-3/66 Unit IV-6/66	Aug. '64		Unit 1 6/65 Unit 2 11/65 Unit 3 3/66 Unit 4 7/66 Unit 5 2/67 Unit 6 8/67	
1484·20	1172 (Revised 1369)	1613	770·67 (Pl. Commission approved 725·00)	2725 (Pre-devaluation value of FE involved)	Original 29·10 crores	2500	P.S. 2090 Talcher Transmission Scheme 371·4	Original 46·97 crores	
2×75	..	Nil	Nil	Nil	247·5	254	Nil	50	
Full Capacity Commenced	80% as on 31-3-66	Unit 2 : 60·57% Unit 3 : 51·75% Unit 4 : 38·84%	Orders for B.F. pump heater, evaporators, oil conditioner received at site. Civil work on progress	Unit I: 44% Unit II : 22% Unit III: 14% Unit IV : 13% Unit V: 12% Common facilities 27%	97·8% (overall construction & installation)	100%		Unit 1—100% Unit 2 30%	
Jan. '60	Appraisal report—12/60 Project report—12/64 (Detailed)	17-12-64	23-1-1961	Jan. '63	15-7-60	Original 24-11-59 Supplementary 5-11-60	30-4-60	(i) 7-4-61 (ii) 22-1-62 (iii) 29-7-64	
No	Advised in May '61	Yes on 14-6-63	No	Not available	..	Yes 29-2-60	No	(1) 11-1-60 (2) 8-9-62	
Jan. '60	Nov. '61	14-6-63	15-4-1961	Oct. '65	31-12-60	29-2-60	4-1-61	7-12-65	
	1961-62	14-5-63	19-2-1963	May '60	20-4-62	4-5-60	Investigation 13-12-60 Entire Project 10-3-61 29-8-61 DLF Loan	27-1-60 for 2×50 MW	
June '60	World Bank loan communicated May '61; IDA loan finalised Feb. '62	AID loan no. 50, dt. 3-3-63	AID loan agreement concluded on 21-5-63	Jan. '60	8-5-62	30-7-60		28-2-62 to 6-11-65	
Jan. '60	Nov. '61	14-5-63	19-2-63	Not yet received	..	29-2-60	10-3-61	..	
Durgapur Project Ltd.	DVC	Delhi Thermal Control Board Chairman Dr. K.L. Rao, 26-9-62	C.E. for electricity	UPSEB	WBSEB	P&P Engineer/C.E. (P&P) 23-6-60	P.S. by various contractors	CE(E) at Patna & Dy C.E. at Patratu—Prior DCE/ESE at Patratu	
Durgapur Project Ltd.	Major civil works—National Projects Construction Corporation Stack Gammon Ltd.	Nil	CE(Civil)	UP State [illegible] Deptt.	..	S.E. (Cons.)/ Engineer in charge 22-6-60	M/s Patel Eng. Co.—Hindustan Const. Co. Mc Nally Bird Eng. Co.	CE(C) at Patna SE(C) at Patratu	
9-11-59	April '62 M/s Burns & Roe, USA	8-7-63 M/s Gibbs & Hills, USA	15-7-63	No consultant	13-8-60	The Kuljian Corp. of USA on 9-8-61	9-10-61	CW&PC 31-8-59	

Appendix

S. No.	Particulars	Trombay	Satpura	Korba	Neyveli	Kalkot	Garo hills	Chandrapura
6	*Project Investigations*							
	(i) Site & Land acquisition Target & date of fixing target	No land acquisition as it was an extension project	Commencement .. Completion ..	Site selection 11/60 Land acquisition 1/62	Extension of existing station	The Project investigation started 3/61; Feasibility report by consultants 6/61	..	I unit; II unit no date fixed.
	Actual		.. 12/62	11/60 12/62				No date fixed; 1 quarter '59 6/59
	(ii) Site surveys & soil investigation	Commencement 1-7-62 Completion 1-9-62	Commencement 9/63 Completion 11/63	Site survey 11/61 Soil investigation 12/61	Extension of the existing station	..	..	No date fixed 1 quarter, 59
	Target & date of fixing target	1-7-62 1-9-62 1-7-62 1-7-62						No date fixed 1 quarter 12/59
	Actual	1-7-62 1-9-62	.. 7/63	7/61 8/62				
	(iii) Water Supply arrangements Target & date of fixing target	1-10-62 1-3-63 1-7-62 1-7-62	5/63 6/63	7/62	Do.	..	..	No date fixed 10/59
	Actual	1-12-62 1-4-63	.. 6/63	12/62				No date fixed 1 quarter '59
	(iv) Access road and railway facilities Target & date of fixing target	1-9-62 1-1-63 1-7-62 1-7-62	.. ..	12/61	Do.	Rope way & access road still under construction. No railway facilities	..	No date fixed 2/60
	Actual	1-9-62 1-1-63	9/63 3/64 (Rly. siding) 5/63 (Road)	1/62				No date fixed 8/60
	(v) Coal availability & ash disposal arrangement	Extension of existing facilities	..	No separate investigations were necessary	..	..	The power house site is at the pithead of coal bearing area. Coalmining is yet to be started	No date fixed 6/59 No date fixed 3/60
7	*Additions and Alterations*							
	(i) Extent of Major Changes	None	N.A.	Change of site away from the existing P.S.	Nil	4 x 5 MW changed in 3 x 7·5 MW 5-1-63	No major changes beyond that cleared by P.C.	None
	(ii) Extent of revision	Project estimates revised to Rs. 1318 lakhs in May '63.	N.A.	Revised cost estimate Rs. 2646 lakhs	Nil	No change in price	64·49(Or) 191·01(R) (Generation) 36·40 (Transmission)	Not applicable
	(iii) Time required to obtain sanction of expenditure	..	N.A.	Submitted 23-2-65 Approval awaited	Project estimate not yet formally sanctioned	Does not arise	Sanction of the Board already obtained	Not applicable
8	*Procurement of Construction Materials*		Indigenous Imported					
	(i) Steel Structures Date of indent	27-2-63	4/62 6-8-63		Unit VI 16-2-63 Unit VII 4-2-64	No delay	Material already received at site	2-4/62
	Anticipated date of delivery.	1-9-63	3/65 1/64	62·63	I quarter '63 IV quarter '64			3-8/62
	Actual date of delivery.	2-6-64 (Imported steel)	6/66 3/64	64·65	III quarter '63 IV quarter '64			6/62—5/63
	(ii) Reinforcement steel Date of indent	15-8-62	..	61·62	Unit VI 16-2-63 Unit VII 4-2-64	Delay in tested steel	Do.	12/61—6/63
	Anticipated date of delivery.	31-8-62 (start of delivery)	..	62·63	I quarter '63 IV quarter '64			1/62—8/63
	Actual date of delivery.	31-8-62 (start of delivery)	..	64·65	III quarter '63 IV quarter '64			6/62—6/64

6—*contd.*

Durgapur (W B)	Durgapur (DVC)	Indra-prastha	Rama-gundam	Obra	Bandel	Dhuvaran	Talcher	Patratu	Remarks
Extension Project	Extension Project	..	2/63 2/63 4/63 4/63	Site selec-tion 7/61 Land acqui-sition 10/61	.. 9/61 .. 6/62 Site survey Soil Invest	Commence-ment Mid. '59 & Feb. '60 (Actual) Completion 2nd half of '59 & April '60 (Actual)	Com. Comp. .. .. 21-9-60 21-9-60 Com. Compl.	Depart-mentally .. 1958 .. 3/63	
Extension Project	Extension Project	..	2/63 8/64 4/63 11/64	.. 1/61 .. 9/63	9/61 9/61 9/61 9/61 12/61 12/61 1/66 12/61	Site Survey June '60 Soil Invens-tigation 11/60(A) Completion End of 60(A) May '61(A)	.. .. 3-4-61 5-1-63	Depart-mentally .. 1959 .. 3/62	
Do.	Already existing	..	3/66 will be commissioned soon 5/66	Con-st. Co-lony 5/64 4/64 12/64 Work still in pro-gress Ac-cess Rly. roads facili-ties	3/62 .. .. .. Ac-cess Rly. roads facili-ties	Com. Com. 5/61 9/61 7/61 1/62	Com. Com-pl. .. 21-2-61 23-8-63	Thr. Nalkarni Dam both for const. & colony strat 1961. Direct water supply from 15-4-65	
Do	Do.	..	.. ..	4/64 2/64 .. 2/65 Work still in pro-gress	10/62 12/62 10/62 12/62 3/63 not com-pleted 7/64 not com-pleted	5/61 11/61 11/61 9/62	.. .. 23-3-62 8-4-63	..	
Do.	.. 6/63 9/63 10/63	..	Coal mines exist within a distance of 6 miles	Singarauli Coal fields are being developed by N.C.D.C. Rly. facili-ties are done by N. Rly.	..	11/63 on-wards ample low lying areas acquired for ash disposal	.. .. 7/61 10/61	N.C.D.C. for coal, ash disposal by pumps	
Nil	None	..	Aerial tope way has been repla-ced by rail-way siding	There has been no ma-jor changes except for rock cut-ting	Capacity of each unit changed from 75 MW to 82·5 MW	Recircula-tion scheme introduced for conden-ser cooling watet	Nil	Installed ca-pacity chan-ged from 100 MW to 400 MW	
Nil	Revised Pro-ject esti-mate Rs. 1369 lakhs	..	Rs. 1080 lakhs (Re-vised)	..	Rs. 3405 lakhs from Rs. 2910 lakhs	578 lakhs (Revised)	Revised Estimate 2555 lakhs 495 lakhs	Revised 5271·1 lakhs	
Does not arise	Not yet arisen	..	Revised esti-mate sub-mitted on 25-4-66 sanc-tion await-ed	..	..	About 31 months	..	..	
..	(i) 8/62 (ii) 8/63 (iii) 6/64(1)1/63 (2)1/64 (3)10/64 (1) 4/64 (2) 4/64 (3) 9/65	There was no delay	5-10-64 1/67 2/67	1/64 2/65 8/65 to10/66 (some sec-tion still not receiv-ed)	9-11-61 2-2-63 2-2-63	This was procured along with main plant. Actual de-livery from Mid. '62	15-2-63 4/64 7/64	2/61	
..	(1) 8/62 (2) 8/63 (3))/64 (1) 1/63 (2) 1/64 (3) 7/64 (1) 4/64 (2) 4/64 (3) 7/65	Do.	..	9/63 3/64 6/64 to 12/65	11-11-61	This has been indented & received on quarterly basis	From time to time	..	

Appendix

S. No.	Particulars	Trombay	Satpura	Korba	Neyveli	Kalakote	Garo Hills	Chandrapura
	Procurement of Construction Materials—contd.							
	(iii) Cement							
	Date of indent	(20-8-62 10-10-62 25-1-63)	17-8-61 (Phased deliveries)	8/61 to 12/64 12/61 to 3/65 5/62 to 5/65	Periodical indents	Delay	Materials already received at site	Quarterly commencing III quar. '60
	Anticipated date of delivery.	(23-10-62 15-12-62 31-1-63)						II quarter '61
	Actual date of delivery.	(23-10-62 15-12-62 31-1-63)						
	(iv) Other materials							
	Date of indent	..	..		Do.		Do.	8/63
	Anticipated date of delivery.							12/63
	Actual date of delivery.							3/64
9	*Landing & Cleaning*							
	(i) Agency for landing	Gujdar & Co. Bombay	M/s MWK International Ltd., Calcutta	D.G.S.&D.	D.G.S.&D., & S.I. Corp., Madras.	M/s A.B. Gursetji	The supplier cleared the goods	M/s Kilburns Boiler Combustion Ltd.
	(ii) Time required for clearance							
	Shortest	5 days	15 days	60 days	12 days	10 days	About 1 month to 2 months	6 weeks
	Longest	5 weeks	6 months	18 months	8 months			16 weeks
	(iii) Agency for checking stores	Project construction officer at site	Erection construction MWK & MPEB	MPSE with Soviet Specialists	Stores Organisation, NLC	Project authorities with consultant staff	Executive Engineer, Garo Hills thermal project	Contractor with DVC field organisation
	(iv) Time required for F.E.							
	Shortest	3 weeks	Some of the claims have been pending	Still most of the things are not finalised	Does not arise	Cannot be said	No FE asked for replacement	8 weeks
	Longest	11¼ months						24 weeks
10	*Civil Works*							
	(i) Levelling	Departmental work			Unit VI Unit VII			
	Date of invitation of tender for major civil work. T	Do.				..	12/61	Departmental
	A	Do.	6-6-63	30-5-62	Already done under first stage 7/65	..	..	Do.
	Date of award of contract for major civil work. T	Do.				..	3/62	Do.
	A	Do.	17-9-63	21-6-62		..	..	Do.
	Date of commencemant. T	7-10-62	..	..	..	..	6/62	3/61
	A	1-1-63	12/63	30-6-62	4/66	..	2/64	12/59
	Date of completion T	1-9-63	..	1-10-62	7/66	..	1/63	11/61
	A	1-7-63	..	31-3-63	Contn.	..	12/64	12/62
	(ii) Site stroes.							
	Date of invitation of tender for major civil work. T	Departmental			Do.	..	..	Departmental
	A	Do.	30-11-63	26-9-62		..	..	Do.
	Date of award of contract for major civil work. T	Do.				..	..	Do.
	A	Do.	14-2-64	20-10-62		..		Do.
	Date of commencement. T	1-9-62	11/64	..		..	11/62	3/62
	A	1-8-62	1/65	23-10-62		..	1/65	6/61
	Date of completion T	1-8-63	7/65	10-4-63		..	6/63	10/62
	A	1-11-63	10/66	20-5-63		..	Final finishing yet to be made	12/61
	(iii) Access roads							
	Date of invitation of tender for major civil work. T	Departmental						Departmental
	A	Do.	15-3-61	13-4-62	Do.	..	..	Do.
	Date of award of contract for major civil work. T	Do.				..	..	Do.
	A	Do.	21-7-61	28-4-62		..	..	Do.
	Date of commencement. T	1-9-62				..	11/62	..
	A	1-9-62		28-4-62		..	1/63	12/59
	Date of completion. T	1-9-63				..	6/63	12/63
	A	1-11-63	5/63	25-8-63		..	Final finishing yet to be made	9/62
	(iv) Railway siding							
	Date of invitation of tender for major civil work. T	Extension of existing siding	..		Do.	Does not arise		Indian Railways
	A		..	30-7-62				
	Date of award of contract for major civil work. T	Do.						Do.
	A	Do.	..	27-8-62				

6—contd.

Durgapur (WB)	Durgapur (DVC)	Indraprastha	Ramagundam	Obra	Bandel	Dhuvaran	Talcher	Patratu	Remarks
	Quarterly intents	There was no delay	..	Intents are placed quarterly		This has been indented & received on quarterly basis	From time to time	..	
	..	Do.		Shortage of explosive due to rock cutting was delayed	14-11-61	Nil		Shortage of asbestos sheets, Alumina cement found defective	
Supplier of major equipment	Kilburns & Co.	M/s Gujdar & Overseas Trading Co.	D.G.S.&D. Bombay & Madras		MWK International USA	M/s Andeshiv B. Gursetjee & Sons, Bombay	IGE, B&W MWK	M/s Arora & Sehgal M/s Fallon's Agency	
2 weeks	6 weeks 24 weeks	1 month 2-3 months	3 weeks 8 weeks		..	1 to 6 weeks	3 months 2 years	One year	
Supplier of major equipment	DVC and contractors	DESU (Departmental staff)	Executive Engineer (E&M) Ramagundam		Wearing House U.S.A.	IGE, Bombay, The Lumus Co., Bombay	Turukey contract Dept. Engineers	Boards Engineers & Russian experts & suppliers	
..	Not a single remittance has been made	..	Not yet arisen		..	Applied on 10-8-66 & is awaited	5 months 9 months	Not yet released	
..	..	3/64	Departmental	5/63 to 11/64	Departmental	10-7-61	4/63 4/63		
..	..	4/64		7/63 to 12/64		11-8-61	7/63 7/63	12/61	
..	..	6/64	6/64	7/63		10-9-61	7/63 7/63	12/61 12/61	
..	..	12/64	6/65	2/65		9-12-61 27-9-62	9/63 10/63	10/62 10/62	
..	..	Departmental	Departmental			17-8-61	7/63 7/63	.. ..	
..	..	Departmental	..	11/63 to 4/66		8-4-61	12/63 12/63		
..	3/63	..	..	..		..	12/63		
..	6/63	3/64	1/66	11/63 to 4/66		17-4-61	12/63	9/62	
..	10/64	..	..	4/64 to 6/66		16-7-61	1/64	..	
..	1/65	10/64	12/66	(construction as need arose)		6-9-61	12/64	10/63	
..	Already existing	..	Departmental road completed		6/62	.. 20-4-61	Departmentally	.. ..	
..		5/64			..				
..		6/64	Do.	3/64 to 12/65	27-9-62 ..	.. 20-5-61	.. ..		
..		..	..	..	28-9-62	..	6/63		
..		6/64	11/66	4/64 to 9/64	28-9-62	19-7-61	6/63	8/62	
..		.. 8/64	.. In progress	.. 9/64 to 2/65	31-12-64	18-9-61 16-1-62	9/63 10/63	5/63	
..	Do.	..	Entrusted to railways	Northern Rly. Authorised in 12/63	E. Rly.	10/60; 3/62	3/63 3/63	Departmental & Rly. Board	
..		..			..	.. 11/60; 4/62	.. 3/63		

S. No.	Particulars		Trombay	Satpura	Korba	Neyveli	Kalakote	Garo Hills	Chandrapura
	Civil Works—contd.								
	Date of commencement.	T	1-10-64	..	..			..	3/60
		A	1-4-65	9/63	29-6-62			..	9/60
	Date of completion.	T	1-2-65	..	..			..	3/62
		A	1-8-65	3/64	31-7-63			..	12/63
	(v) Concrete works for building					Unit VI Unit VII			
	Date of invitation of tender for major civil work.	T	1-1-64	..	..	Work done through piece work contractor	..	10/62	Departmental
		A	24-2-64	6-6-63	6-9-62		5/63	3/64	
	Date of award of contract for major civil work.	T	20-3-64	..	..		..	1/63	Departmental
		A	20-3-64	17-9-63	20-10-62		11/63	12/64	
	Date of commencement.	T	1-2-64	2/64	..	1/63 3/64	..	2/63	8/61
		A	15-4-64	1/64	11/62	8/63 12/64	6-12-63	12/64	3/62
	Date of completion.	T	1-11-64	8/65	24-11-64	3/64 2/66	7-7-65	3/64	12/63
		A	30-10-64	9/66	In progress	12/64 10/66	12/65	12/65	7/64
	(vi) Concrete works for T. G. Foundation								
	Date of invitation of tender for major civil work.	T	26-9-62	..	..	Work done through piece work contractor	..	..	Departmental
		A	26-9-62	6-6-63	6-9-62		..	..	
	Date of award of contract for major civil work.	T	1-11-62	..	..		..	..	Departmental
		A	2-11-62	17-9-63	20-10-62		..	..	
	Date of commencement.	T	7-12-62	10/64	..	4/64 11/64	..	3/64	3/62; 7/62
		A	1-4-63	9/64	11/62	4/64 4/65	..	1/65	11/62; 1/63
	Date of completion.	T	1-6-63	12/65	24-11-64	9/64 4/65	..	6/64	10/62; 2/63
		A	19-6-63	3/66	In progress	9/64 9/65	..	5/65	4/63; 7/63
	(vii) Fabrication of structures								
	Date of invitation of tender for major civil works.	T	1-11-63	..	..	Executed through project workshop	..	Under progress	2/61
		A	3-12-63	6-6-63	6-9-62		6/64		2/61
	Date of award of contract for major civil work	T	1-12-63	..	..		..	..	5/61
		A	17-1-64	17-9-63	20-10-62		12/64	..	10/61
	Date of commencement.	T	1-12-63	6/64	..	6/63 11/64	..	..	7/61
		A	1-3-64	6/64	11/62	6/63 9/64	25-12-64	..	11/62
	Date of completion.	T	31-5-65	12/65	24-11-64	10/64 10/65	..	..	11/62
		A	1-4-65	12/66	In progress	3/66 3/66	25-12-65	..	10/63
	(viii) Erection of superstructure								
	Date of invitation of tender for major civil work.	T	3-12-63	..	..	Work done through piece work contractor	..	Under progress	2/61
		A	3-12-63	6-6-63	6-9-62		..	..	2/61
	Date of award of contract for major civil work	T	17-1-64	..	..		..	..	5/61
		A	17-1-64	17-9-63	20-10-62		..		10/61
	Date of commencement.	T	21-4-64	12/64	..	9/63 2/65	..	..	11/62
		A	1-3-64	7/65	11/62	12/63 2/65	..	..	2/63
	Date of completion.	T	31-5-65	12/65	24-11-64	3/65 6/66	..	..	4/63
		A	1-4-65	12/66	In progress	4/65 8/66	..	..	2/64
	(ix) C.W. system					Unit VI Unit VII			
	Date of invitation of tender for major civil work.	T	Departmental work	Dam on Tawa River 4-9-63	The work is entrusted to State Irrigation department	Work done through piece work contractors	..	Under progress	Departmental
	Date of award of contract for major civil work	T	Do.	..					Departmental
		A		6-2-64					
	Date of commencement.	T	1-2-63	..	..	Already exist. under Stage I	11/64 3/65 2/66 6/66		8/62
		A	1-7-63	3/64					9/63
	Date of completion.	T	1-11-63	6/66	1/64				8/63
		A	1-9-63	Work in progress	Not complete				8/64
	(x) Cooling tower								
	Date of invitation of tender for major civil work.	T	Not applicable	..	The work is entrusted to State Irrigation department	..	..	Under progress	..
		A							10/64
	Date of award of contract for major civil work	T	Do.	..		..	..		12/61
		A							10/61
	Date of commencement.	T	..	..	..	..	..		9/62
		A							4/62
	Date of completion.	T	..	..	1/64	..	..		10/63
		A			Not complete				9/63; 6/64

6—*contd.*

Durgapur (WB)	Durgapur (DVC)	Indraprashta	Ramagundam	Obra	Bandel	Dhuvaran	Talcher	Patratu	Remarks
..		..			..	..	3/63	..	
..		..			24-12-62	12/60; 4/62	3/63	1/62	
..									
..		12/66			31-7-64	3/61; 5/62	8/64	Not yet	
..		In progress			..	9/61; 11/62	8/64	completed	
								1&2 3&4	
31-7-61	6/63	10/64	..	..	5-12-61	..	..	..	
	7/63	10/64	..	11/63	..	7/61		8/62 2/64	
30-8-61	12/63	12/64	..		3-3-62	..		..	
	12/63	3/65	..	4/64	..	11/61		2/63 8/64	
30-8-61	4/64	12/64	..	..	28-3-62	..	2/64	2/63 ..	
	4/64	3/65	9/66	5/64	28-3-62	11/61	2/64	3/63 10/64	
7/62	10/65	5/66	..	..	30-10-63	6/61	8/65	6/64 2/66	
	5/66	In progress	2/67	In progress	31-1-64	6/63	12/66	12/65 6/66	
31-7-61	6/63	10/64	..	..	5-12-61	..	..	..	
	7/63	10/64	5/65	11/63	..	..	..	8/62 2/64	
30-8-61	12/63	12/64	..	..	2-3-62	..	..	.. ..	
	12/63	3/65	8/65	4/64	..	11/62	..	2/63	
21-4-62	11/64	12/64	10/65	3/65	28-3-62	..	11/63	5/63 9/64	
	11/64	3/65	10/65	7/65	28-3-62	..	11/63	5/63 2/65	
12/62	3/65	5/66	11/66	5/66	30-10-63	..	11/64	5/64 2/66	
	3/65	In progress	80% completed by end of 8/66	Unit 1:11/66 2:6/66 3,4,5: in progress	31-1-64	4/63	10/66	5/64 3/66	
31-7-61	7/63	..	..	11/63	22-11-62	..	2/63	.. ..	
	7/63	11/63	5/65	..	..	12/61	3/63	.. 2/64	
30-8-61	11/63	..	..	..	28-1-63	..	8/63	.. ..	
	11/63	3/64	..	4/64	..	3/63	9/63	2/64 8/64	
15-1-62	6/64	..	10/65	..	2-2-63	..	3/64	2/64 9/64	
	11/64	..	10/66	9/65	2-2-63	5/62	3/64	11/64 2/65	
6/63	1/63	..	1/67	..	15-12-63	8/62	12/64	8/64 2/66	
	10/65	3/65	..	11/65	30-4-64	6/63	1/67	3/65 In progress	
31-7-61	7/63	10/64	..	..	14-8-63	..	..	.. ..	
	7/63	10/64	5/65	11/63	..	6/62	..	.. ..	
30-8-61	11/63	12/64	..	..	21-1-64	..	..	10/62 2/64	
	11/63	3/65	8/65	4/64	..	1/63	..	2/63 8/64	
10-2-62	10/64	12/64	2/66	..	12/63	..	12/64	11/63 9/65	
	3/65	3/65	2/66	10/65	4/64	4/63	12/64	11/63 3/66	
12/63	7/65	5/66	1/67	..	31-12-64	..	6/65	5/64 12/65	
	12/65	In progress	30% completed by end of 8/66	In progress	..	5/64	1/67	5/65 5/66	
								1&2 3&4	
22-9-61	..	10/64	..	..	10-3-61	..	..	..	
	12/63	10/64	5/65	11/63 & 6/64	..	5/61	..	7/62 1/64	
8-12-61	..	12/64	..	..	16-9-61	..	..	2/63 10/64	
	4/64	3/65	8/65	4/64 & 9/64	..	7/61	..	2/65 ..	
20-12-61	4/64	12/64	2/66	..	1-5-64	..	1/64	2/65 ..	
	4/64	3/65	2/66	10/64	4/65	7/61	1/64	2/65 ..	
6/63	12/65	5/66	1/67	..	30-9-64	10/62	6/64	6/65 ..	
	1/66	In progress	56% completed by end of 8/66	In progress	7/65	1/63	3/66	12/65 ..	
								1 &2	
22-9-61	None	Nil	Already completed	.. ..	.. ..	Nil	.. ..	.. ..	
8-12-61	Do.	Do.	.. ..	.. ..	.. ..	Do.	.. ..	10/62 2/63	..
20-12-61	Do.	Do.	.. 10/63	.. ..	.. ..	Do.	.. ..	6/63 3/63	.. ..
6/63	Do.	Do.	.. 11/64	.. ..	.. ..	Do.	.. ..	6/65 11/65	.. ..

Appendix

S. No.	Particulars		Trombay	Satpura		Korba		Neyveli		Kolakote	Garo Hills	Chandrapura	
	Civil Workers—contd.												
	(xi) Coal & ash handling system			Coal	Ash							Coal	Ash
	Date of invitation of tender for major civil work.	T	29-9-63	..	..	..		..		..	Under progress	4/61	Deptt.
		A	21-9-63	..	..	6-9-62						10/61	
	Date of award of contract for major civil work	T	1-11-63	..	..	..		..		..	..	2/62	Deptt.
		A	1-11-63	..	..	20-10-62						8/62	
	Date of commencement.	T	1-11-63	1/65	1/65	..		..		..	..	9/62	2/63
		A	1-11-63	11/65	3/66	11/62						3/63	10/63
	Date of completion.	T	31-5-64	8/65	8/65	24-11-64		..		..	..	6/63	12/63
		A	14-5-64	11/66	10/66	In progress						3/64	8/64
	(xii) Stack												
	Date of invitation of tender for major civil work.	T	19-12-62	...		..		..		..	..	10/61	
		A	19-12-62									7/62	
	Date of award of contract for major civil work	T	5-4-63	..		..		..		..	..	1/62	
		A	5-4-63									10/62	
	Date of commencement.	T	1-10-63	..		..		..		..	..	4/62	
		A	1-11-63									3/63	
	Date of completion.	T	1-10-64	..		..		..		..	..	7/63	
		A	30-6-64									3/64	
11	*Design & erection of Plant & Equipment*												
						Unit 1 & 2 C/EM	Unit 3 & 4 C/EM	Unit VI	Unit VII				
	(i) *Boiler*												
	Date of receipt of necessary information & drawings.	T	1-9-62	..		10/62	4/64	..	..	..	..	3/62	
		A	29-3-63	5/63		12/63	4/64	3/64	7/65		9/64	2/61	
	Date of release of working drawings	T	..	..		11/62	8/64	11/64	10/65		No Consultant.		
		A	..	6/63		4/64	9/64	11/64	7/65			6/62	
						Unit 1	Unit 2,3,4					11/61	
	Date of commencement of erection of equipment.	T	1-8-63	3/64		11/62	In	4/63	7/66		Construction	10/62	
		A	19-9-63	4/64		2-10-64	progress	8/65	..		In progress.	5/62; 8/62	
	Date of completion of erection of equipment.	T	15-6-65	8/66		6/64						3/64; 6/64	
		A	4-6-65	In progress		4/66						9/64; 2/65	
	(ii) *Turbo-Generator*												
	Date of receipt of necessary information & drawings.	T	1-12-63	..		11/62	3/64	..	..	14-4-63	..	6/62	
		A	29-3-63	5/63		12/63	8/64	3/64	7/65	5/63	8/64	8/60	
	Date of release of working drawings	T	..	..		12/62	8/64	11/64	9/65	..	No consultant.	1/63	
		A	..	8/65		4/64	9/64	11/64	10/65			9/62	
						Unit 1	Unit 2,3,4	4/65	8/66				
	Date of commencement of erection of equipment.	T	1-4-64	8/65		12/62	In	8/65	..	..	Construction	6/63	
		A	1-2-64	7/66		1/65	progress				In progress.	10/63; 2/64	
	Date of completion of erection of equipment.	T	30-5-65	12/66		8/64				12/65		3/64; 7/64	
		A	4-7-65	In progress		8/66						9/64; 2/65	
	(iii) *Boiler Aux. Equipment*												
	Date of receipt of necessary information & drawings.	T	1-7-63	..		10/62	8/64	..	..	..	..	5/63	
		A	11-7-63	..		12/63	10/64	3/64	8/65		12/64	1/62	
	Date of release of working drawings.	T	..	..		11/62	8/64	11/64	10/65		No consultant	7/63	
		A	..	3/65		4/64	9/64	11/64	9/65			7/62	
						*Unit 1	*Unit 2,3,4						
	Date of commencement of erection of equipment.	T	1-5-64	11/64		11/63	In	4/65	8/65		Construction	9/63	
		A	1-6-64	1/66		11/64	progress	8/65	..		in progress.	11/63; 8/64	
	Date of completion of erection of equipment.	T	30-6-65	9/65		3/64						2/64	
		A	31-3-65	In progress		4/66						4/64; 2/65	
	(iv) *Turbine Aux. Equipment*												
	Date of receipt of necessary information & drawings.	T	1-7-63	..		5/63	5/64	..	..	..	..	7/62	
		A	11-7-63	..		2/63	8/64	2/64	8/65		12/64	5/62	
	Date of release of working drawings.	T	..	..		6/63	6/64	11/64	10/65		No consultant.	10/62	
		A	..	8/64		10/63	9/64	12/64	9/65			8/63	
	Date of commencement of erection of equipment.	T	1-2-64	8/65		*7/63	In	4/65	8/65		Construction	3/63	
		A	1-2-64	8/66		1/65	progress	8/65	..		In progress.	10/63; 2/64	
	Date of completion of erection of equipment.	T	1-8-64	10/66		6/64						10/63; 2/64	
		A	1-8-64	In progress		4/66						5/64; 12/64	

6—contd.

Durgapur (WB)	Durgapur (DVC)	Indra-prastha	Rama-gundam	Obra		Bandel	Dhuvaran	Talcher	Patratu	Remarks
				Coal	Ash					
4-9-62	6/63	..	..	..	..	5-8-61	..	..	..	
..	7/63	8/66	..	11/63	11/63 & 6/64	..	9/62	..	..	
10-11-62	12/63	..	..	4/64	11/63	16-9-61	..	..	10/62	
..	12/63	10/66	..	8/64	..	..	11/62	..	3/63	
1-12-62	2/65	..	10/66	10/64	11/64	11/63	..	9/64	4/63	
..	2/65	10/66	10/66	3/65	..	2/64	12/62	9/64	4/63	
6/63	3/66	12/66	6/67	11/66	9/66	30-11-64	5/63	1/65	11/63	
..	8/66	In progress	In progress	..	..	..	6/63	In progress	10/65	
..	12/63	12/64	..	..		..	..	..	..	
..	3/64	2/65	..	..		..	..	..	..	
..	6/64	..	..	..		..	..	..	..	
..	9/64	6/65	..	..		..	..	..	..	
..	2/65	..	..	..		..	..	..	..	
..	2/65	6/65	..	..		..	..	..	..	
..	12/65	1-9-65	..	..		..	..	..	..	
..	3/66	7/66	..	..		..	..	..	..	
2/61 to 2/62	4-11-63	..	6/64	11/63		10-3-61			12/62	
	5-12-63	9-1-64	5&10/65						11/62	
		..	9/65	12/63		10-3-61			..	
	10/63-9/64	8-1-64	1-10-65						..	
	2/64-4/65									
9/62	10/64	..	6/65	10/64		12/62	12/62	..	5/64	
	10/64	24-10-64	15-7-66	9/65		5/63	12/62	8/64	5/64	
6/64	5/66	..	4/66	10/66		11/65	5/64	9/67	10/65	
	6/66		..	continuing			2/65	..	12/65	
1/61 to 12/61	4-8-63	..	2/63	11/63		..			12/62	
	1-2-64		..			10-3-61			10/62	
..	12/65-6/64	..	9/65	12/63		..			..	
	8/64-10/64	5-2-64	5-1-66			10-3-61			..	
9/62	8/65	..	3/65	7/65		10/63	2/63	..	1/65	
	8/65	12/65	..	4/66		1/63	1/63	7/65	6/65	
6/64	6/66	..	4/66	11/66		30-9-64	5/64	1/68	10/65	
	9/66		..	continuing		progressing	2/65	..	2/66	
2/61-2/62	11/63-2/64	..	11/64	11/63		..	Covered	..	8-12-63	
	5-6-64		..			10-3-61	under boilers	..	4-12-63	
..	6/64	..	1-10-65	12/63		..			..	
	10/64		8-8-66			10-3-61			..	
11/62	10/65		2/65	1/65		8/63			5/64	
	12/65		..	11/65		7/63			5/64	
7/64	2/66		2/66	10/66		30-11-63			10/65	
	6/66		..	continuing		30-11-63			12/65	
1/61-12/61	10/53	..	8/64	11/63		..	Covered	..	8-12-63	
..	9/64		..			10-3-61	under T.G. sets		4-12-63	
..	12/65-6/64	..	5-1-66	12/63		..		..	..	
	10/64-1/65					10-3-61			..	
1/62	9/65	..	4/65	2/65		7/63			1/65	
	9/65	1/66	..	11/65		9/63			1/65	
5/64	2/66	..	1/66	10/66		31-5-64			10/65	
	4/66		..	continuing		8/65			3/66	

Appendix

S. No.	Particulars		Trombay	Satpura	Korba		Neyveli		Kalakote	Garo Hills	Chandrapura	
	Design & Erection of Plant & Equipment—contd.											
	(v) *Power Station Piping*				Unit 1&2	Unit 3&4	Unit VI	Unit VII				
	Date of receipt of necessary information & drawings,	T	15-12-62	..	..		..		..	..	..	
		A	19-12-62	2/65	..		..		..	..	..	
	Date of release of working drawings.	T	..	..	3/64	11/64	..	..	..	..	..	
		A	..	..	4/64	12/64	12/64	4/65	..	..	..	
					Unit 1	Unit 2,3,4						
	Date of commencement of erection of equipment.	T	1-6-64	1/65	1/64	In	9/65	11/65	..	Construction	8/63	
		A	1-7-64	12/65	12/64	progress	1/64	12/65	..	in progress	10/63;	8/64
	Date of completion of erection of equipment.	T	1-6-65	12/66	6/64		4/65	6/66	..		5/64	
		A	1-6-65	In progress	5/66		8/65	..	..		9/64;	3/65
	(vi) *Control Instrumentation*				Unit 1&2	Unit 3&4						
	Date of receipt of necessary information & drawings.	T	1-10-63	..	1/64	2/65	..	..	..	..	2/63	
		A	26-5-64	2/65			5/64	7/65	..	..	4/63	
	Date of release of working drawings.	T	..	..	2/64	2/65	1/65	11/65	..	..	5/63	
		A	..	10/65			9/64	12/65	..	..	7/63	
					Unit 1	Unit 2,3,4						
	Date of commencement of erection of equipment.	T	1-11-64	7/65	12/63	In	4/65	6/66	..	Construction	8/63	
		A	1-11-64	8/66	12/64	progress	8/65	..	..	in progress	3/64;	9/64
	Date of completion of erection of equipment.	T	1-7-65	10/66	6/64						3/64;	5/64
		A	1-7-65	In progress	6/66						10/64;	3/65
	(vii) *Turbine House Crane*											
	Date of receipt of necessary information & drawings.	T	..	8/64	..		..		Completed	..	..	
		A	..	8/64	..		..			..	..	
	Date of release of working drawings.	T	..	..	..		..		..	..	..	
		A	..	12/64	..		..		..	..	..	
	Date of commencement of erection of equipment.	T	..	5/65	6/63		..		..	Construction	3/63	
		A	..	11/65	11/64		..		..	in progress	6/63	
	Date of completion of erection of equipment.	T	..	7/65	10/63		..		..		5/63	
		A	..	1/66	3/65		..		..		8/63	
	(viii) *Switchgear*				Unit 1&2 C/EM	Unit 3&4 C/EM	Unit VI	Unit VII				
	Date of receipt of necessary information & drawings.	T	15-8-63	2/65	2/64	2/64	..	..	..	..	3/63	
		A	13-3-64	6/65	1/64	2/65	5/64	7/65	..	..	11/62	
	Date of release of working drawings.	T	..	..	3/64	3/64	12/64	11/65	..	..	5/63	
		A	..	6/65	2/64	2/65	3/64	4/66	..	..	8/63	
					Unit 1	Unit 2,3,4						
	Date of commencement of erection of equipment.	T	1-10-64	8/65	11/63	In	1/65	8/66	..	Construction	8/63	
		A	1-10-64	4/66	12/64	progress	8/65	..	..	in progress	1/64	
	Date of completion of erection of equipment.	T	1-3-65	1/66	5/64						1/64	
		A	1-6-65	In progress	2/64						10/64	
	(ix) *Step up station*				Unit 1&2 C/EM	Unit 3&4 C/EM	Unit VII					
	Date of receipt of necessary information & drawings.	T	1-10-63	1/65	7/63		..		..	..	4/63	
		A	13-6-63	3/65	12/63	12/63	..		..	..	6/62	
	Date of release of working drawings.	T	..	..	1/64	1/64	..		..	..	5/63	
		A	..	..	1/64	1/64	12/65		..	..	5/63	
					Unit 1	Unit 2,3,4						
	Date of commencement of erection of equipment.	T	1-9-64	8/65	7/63	In	8/65	..	..	Construction	7/63	
		A	1-12-64	4/66	12/64	Progress	11/65	..	..	in progress	12/63	
	Date of completion of erection of equipment.	T	1-2-65	3/66	5/64		8/66		..		12/63	
		A	1-6-65	In progress	6/66		..		..		4/64;	9/64

6—*contd.*

Durgapur (WB)	Durgapur (DVC)	Indraprastha	Ramagundam	Obra	Bandel	Dhuvaran	Talcher	Patratu	Remarks
1/61-11/61	..	..	12/64	11/63	..	..	..	5/63	
..	..	..	Yet to be received	..	10-3-61	..	..	5/63	
..	9-12-64	..	..	12/63	..	..	..	..	
..	1-8-65	12/65	..	..	10-3-61	..	..	..	
11/62	9/65	..	6/65	7/65	10/63	1/63	..	10/64	
..	2/66	1/66	..	9/65	9/63	1/63	10/64	12/64	
3/64	5/66	..	4/66	11/66	31-1-65	5/64	6/67	10/65	
..	9/66	..	..	Continuing	Progressing	4/65	..	2/66	
3/61—12/61	12/64-3/65	..	2/65	11/63	10-3-61	..	..	..	
..	7/65	..	Yet to be received	..	..	..	..	..	
..	5/65	..	..	12/63	10-3-61	..	..	..	
..	8/65	15-12-65	..	..	..	..	..	..	
6/63	12/65	..	8/65	8/65	12/63	5/63	..	11/64	
..	4/66	1/66	..	1/66	5/64	6/63	10/64	12/64	
5/64	5/66	..	4/66	11-66	31-12-64	11/63	6/67	9/65	
..	10/66	..	..	Continuing	Not yet completed	5/64	..	3/66	
12/60-2/61	..	..	12/64	11/63	..	..	..	..	
..	..	..	6/65	..	10-3-61	..	..	..	
..	..	Schematic	1-4-66	12/63	..	..	..	..	
..	..	10-6-65	11-2-66	..	10-3-61	..	..	..	
7/62	..	..	8/65	5/65	8/63	..	..	8/64	
..	..	1/66	..	10/65	8/63	8/63	6/64	8/64	
12/62	..	..	11/65	6/65	30-9-63	..	..	10/64	
..	..	7/66	..	2/66	12/63	5/65	9/64	11/64	
6/61-10/61	2/64	..	3/65	11/63	..	..	..	8-12-63	
..	2/64	..	Yet to be received	..	10-3-61	..	..	4-12-63	
..	6/64	..	..	12/63	..	..	..	..	
..	5/65	..	..	..	10-3-61	..	..	..	
12/62	10/65	..	10/65	6/65	11/63	2/63	..	11/64	
..	11/65	7/66	..	11/65	7/64	6/63	6/66	11/64	
6/64	2/66	..	4/66	10/66	31-10-64	3/64	10/67	10/65	
..	6/66	In progress	..	Continuing	Progressing	4/65	..	2/65	
6/61-10/61	3/64	Not yet started	11/64	11/63	..	..	..	7/63 to	
..	1/64		11-12-65	..	10-3-61	..	..	8/63	
..	7/64		..	12/63	..	..	..	..	
..	7/64		8-8-66	..	10-3-61	..	..	..	
12/62	1/66		7/65	8/65	10/63	..	..	9/64	
..	5/66		..	7/66	10/63	8/63	12/65	9/64	
6/64	4/66		2/66	10/66	31-7-64	..	8/67	9/65	
..	9/66		..	Continuing	Progressing	5/65	..	1/66	

Appendix

S. No.	Particulars		Trombay	Satpura	Korba	Neyveli	Kalakote	Garo Hills	Chandrapura
	Design & Erection of Plant & Equipment—concld.								
	(x) *Coal handling System*				C/EM	Unit VI			
	Date of receipt of necessary information & drawings	T	31-12-63	1/65	3/63		..	..	..
		A	22-4-64	1/65	12/63		..	..	..
	Date of release of working drawings.	T	..	..	3/63		..	..	..
		A	..	11/65	1/64	9/64		..	..
	Date of commencement of erection of equipment.	T	1-7-64	3/65	12/62	..		Construction in progress	7/63
		A	1-8-63	3/66	11/64	3/65			6/63
	Date of completion of erection of equipment.	T	1-6-65	6/66	4/64	..	..		3/64
		A	1-10-65	In progress	9/66	..	..		8/64
	(xi) *Water treatment Plant*				C/EM				
	Date of receipt of necessary information & drawings.	T	1-9-63	7/64		..	..	..	.
		A	10-4-64	9/64		..	..	..	..
	Date of release of working drawings.	T	..	..	12/62	..	..	..	..
		A	..	10/65	1/64	8/64	..	..	..
	Date of commencement of erection of equipment.	T	1-8-64	7/65	1/63	..	..	Construction in progress	7/63
		A	1-7-64	2/66	2/64	..	..		12/63
	Date of completion of erection of equipment.	T	1-4-65	11/66	2/64	..	..		12/63
		A	1-3-65	In progress	3/66	..	..		5/64
	(xii) *Fuel oil plant*			Tanks pumps	C/EM				
	Date of receipt of necessary information & drawings	T	1-11-63	.. ..	..	Stage I facilities will be utilised for Stage II.	..	..	2/63
		A	29-10-63	.. ..	..		..	..	..
	Date of release of working drawings.	T	..	.. ..	8/62 9/62		..	..	4/63
		A	..	.. 11/64	1/64 3/64			..	12/63
	Date of commencement of erection of equipment.	T	1-3-64	1/65 5/65	3/63		..	Construction In progress.	3/64
		A	1-3-64	2/66 7/66	7/64		..		3/64
	Date of completion of erection of equipment.	T	1-1-65	8/65 10/65	1/64		..		5/64
		A	1-1-65	In progress	3/66		..		5/64; 5/64
	(xiii) *Power Station Cabling*				C/EM	Unit VI Unit VII			
	Date of receipt of necessary information & drawings.	T	1-9-63	7/64		.. ..	.	..	..
		A	26-3-64	7/64		.. ..	..	..	..
	Date of release of working drawings.	T	..	..	8/63 9/63	..	..	..	3/63
		A	..	12/65	6/64 6/64	7/64 12/65	..	..	1/63
	Date of commencement of erection of equipment.	T	1-10-64	5/65	5/63	8/64 7/66	..	Construction in progress.	7/63
		A	1-7-64	11/65	6/65	11/64 9/65	..		12/63; 1/64
	Date of completion of erection of equipment.	T	1-7-65	1/67	6/64	3/65 6/66	..	..	4/64
		A	1-7-65	In progress	2/66	8/65 ..	..	..	9/64; 5/65
	(xiv) *Piping Insulation*								
	Date of receipt of necessary information & drawings.	T	1-7-63	..	..	..	..	..	..
		A	11-7-63	..	..	..	..	..	..
	Date of release of working drawings.	T	..	..	..	..	..	..	..
		A	..	..	..	..	..	..	..
	Date of commencement of erection of equipment.	T	1-10-64	..	..	..	..	Construction in progress	4/64
		A	1-9-64	..	..	..	..		1/64
	Date of completion of erection of equipment.	T	1-7-65	..					7/64; 10/64
		A	1-8-65	..	..	..	..	..	11/64; 3/65
12	*Commissioning*								
	(i) *Procurement of oils, lubricants*								
	Date of indent . .		26-3-65	10-5-65 (Lubri.) 7/66 (F. oil)	2/66 (L. oil) 11/65 (F. oil)	From N.L.C. Stores	..	..	7/64 (H. oil) 9/63 (Light ,,) 6/63 (L. oil) 6/63 (C. oil)
	Anticipated date of delivery.		15-6-65	11/66 (Lubri.) 12/66 (F. oil)	3-4-66 (L. oil) 3/66 (Fur. ")				8/64 (H. oil) 3/64 (Light ") 12/63 (L. oil) 1/64 (C. oil)
	Actual date of delivery		2-7-65	Not yet received.	5-6/66 (L. oil) 7-8-66 (Fur. ")				11/64 (H. oil) 5/64 (Light oil) 4/64 (Lub. oil) 8/64 (C. oil)

6—*contd.*

Durgapur (WB)	Durgapur (DVC)	Indraprastha	Ramagundam	Obra	Bandel	Dhuvaran	Talcher	Patratu	Remarks
8/61-5/62	12/64-3/65 1-3-65	Dumper foundation 27-9-66	11/64 11/66	11/63 ..	.. 10-3-61	.. ..	.. ..	11/62 to 7/63	
.. ..	4-8-65 1-10-65	27-9-66 20-3-66	.. ..	12/63 ..	.. 10-3-61	.. ..	.. ..	.. ..	
6/63 ..	10/65 9/65	.. 20-2-66	7/65 ..	2/65 12/65	11/63 2/64	1/63 1/63	.. 1/66	1/65 1/65	
6/64 ..	6/66 9/66	11-8-67 In progress	2/66 ..	5/65 Continuing	31-7-64 In progress	9/63 8/64	6/67 ..	9/65 3/66	
1/61-12/61 ..	9/64-1/65 9/64-12/65	.. ..	11/64 ..	11/63 ..	.. 10-3-61	.. ..	.. ..	.. ..	
.. ..	9/64-1/65 3-11-65	.. ..	1-10-66 Not yet commenced.	12/63 ..	.. 10-3-61	.. ..	.. ..	.. ..	
1/63 ..	10/63 1/63	.. ..	8/65 ..	10/64 7/66	1/64 10/64	.. ..	.. 1/65	9/65 3/65	
6/64 ..	2/66 6/66	.. ..	9/65 ..	1/65 Continuing	31-7-64 4/65	.. ..	.. ..	9/65 11-12-65	
2/61-2/62 ..	10/64 10/64	.. ..	1/65 Yet to be received	11/63 ..	.. 10-3-61	.. ..	.. ..	1/63 11/62	
.. ..	3/65 8/65	.. ..	.. ..	12/63 ..	.. 10-3-61	.. ..	.. ..	.. ..	
8/63 ..	6/65 4/66	.. ..	11/65 ..	9/64 8/65	1/64 3/65	.. 1/65	.. ..	12/64 5/65	
5/64 ..	12/65 8/66	.. ..	3/66 ..	1/65 11/65	23-1-64 4/65	.. 10/65	.. ..	9/65 11-12-65	
3/61-12/61 ..	.. ..	.. ..	2/65 No drawings from manufacturer	11/63 ..	.. 10-3-61	.. ..	.. ..	8/63 8-10/63	
.. ..	.. ..	.. ..	..	12/63 ..	.. 10-3-61	.. ..	.. ..	.. ..	
12/62 ..	8/65 12/65	.. ..	6/65	.. 12/65	7/63 7/63	.. 1/63	.. 10/66	11/64 11/64	
1/64 ..	4/66 12/66	.. ..	4/66 ..	.. Continuing	31-12-64 Progressing	.. 7/65	5/67 ..	9/65 2/65	
.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	Covered under power station piping.	.. ..	.. ..	
.. ..	.. ..	.. ..	.. ..	.. ..	.. ..		.. ..	.. ..	
.. ..	.. ..	.. ..	.. ..	.. ..	.. ..		.. ..	.. ..	
12/63-1/64	4/66 (H.oil) 5/65 (L.oil) 7/65 (C.oil)	..	..	10/66-12/66	..	As per erection contract.	Expected to be placed shortly.	Oil for turbine & transformer was received from USSR along with lubricants.	
4-5-64	9/66 (H.oil) 9/65 (L.oil) 3/66 (C.oil)		8/67	11/66-3/67					
	9/66 (H.oil) 12/65 (L.oil) 3/66 (C.oil)		..	11/66-3/67					

Appendix

S. No.	Particulars	Trombay	Satpura	Korba	Neyveli	Kalakote	Garo Hills	Chandrapura
	(ii) *Precommissioning Test—Commencement*				VI VII			
	Target . . .	1-2-65	..	..	15-3-65 15-7-66	..	Yet to be commissioned.	3/64; 7/64
	Actual . . .	1-2-65	..	..	21-7-65 24-8-65	..		7/64; 2/65
	Completion							
	Target . . .	15-6-65	..	..	15-4-65 15-9-66	..	..	6/64; 10/64
	Actual . . .	1-7-65	..	..	24-8-65 In progress	..		9/64; 4/65
13	*Periods of Hold-ups (Due to)*							
	(i) Additional investigations.	..	Nil	..	..	..	..	None
	(ii) Non-availability of scarce.	..	24 weeks steel section	..	..	..	..	None
	(iii) Delays in receipt of construction material.	Delays were made good later.	..	..	..	..	..	24 weeks for structural steel 12 weeks for cement.
	(iv) Delay in construction drgs.	..	..	Yes	Yes	Yes	..	Yes
	(v) Changes in foundation	..	..	16 weeks	16 weeks	Nil	..	None
	(vi) Change in scope .	..	..	..	..	Yes	..	None
	(vii) Scope of works sanction.	..	..	..	..	Nil	..	None
	(viii) Shipment . .	Yes	Yes	Yes	Yes	Yes	..	Yes
	(ix) Landing & clearing .	Yes	Yes	..	..	Yes	..	4 weeks
	(x) Receipt of erection equipment.	Yes	..	..	..	Yes	..	None
	(xi) Procedural delays .	..	..	..	..	Nil	..	60 weeks protracted negotiations with C.E. Co.
	(xii) Labour strikes etc. .	..	..	..	..	Yes	..	20 weeks
	(xiii) Co ordination . .	..	..	..	..	Yes	.	None
	(xiv) Other reasons .	Yes	Yes, 5 months arrival of TG erection supervision—7 months FE release for erection contract.	..	..	..	..	(i) Erection of structural steel —24 weeks (ii) persistent failure of boiler feed pumps-12 weeks.

6—*contd.*

Durgapur (WB)	Durgapur (DVC)	Indraprastha	Ramagundam	Obra	Bandel	Dhuvaran	Talcher	Patratu	Remarks
I II 2/64; 7/64	3/66 6/66	.. ..	7/67 ..	11/65 12/66	.. 7-10-64 (Unit 1)	.. ..	6/67 ..	5/65 3/66	
5/64 8/64	6/66 10/66	.. ..	.. ..	12/65 Continuing	.. 24-5-66 (Unit 4)	.. ..	8/67 ..	6/65 6/66	
..	None	..	25 weeks in connection with site selection.	..	..	..	..	..	
..	None	Nil	Nil	..	..	..	..	..	
Some difficulty was experienced in getting stonechips for civil construction.	Yes	Yes	Nil	..	..	..	Yes	24 weeks (Steel).	
..	24 weeks	No	Nil	..	..	..	Yes	16/32 weeks (civil).	
..	None	..	Nil	..	..	8 weeks	..	..	
..	None	..	25 weeks facilities-coal handling water supply.	..	..	24 weeks	..	..	
..	Does not arise.	No	Nil	..	..	—	..	..	
..	12 weeks TG 10 weeks Instrumentation 8 weeksWT plant.	Yes	..	..	Delay of 10 months due to strikes in USA.	8 weeks	Yes	Yes	
..	Average 6 weeks	Yes	4/5 weeks structural steel.	..	..	..	..	Yes	
..	None	Yes	Nil	..	6 months for non-availability of I/L.	—	..	Yes	
..	Delay in F.E. sanction for boilers TG set.	Yes	52 weeks finalisation of contract.	..	..	..	..	Yes, due to F.E. 6 months.	
..	..	Nn	Nil	..	MWK-28 days.	8 weeks	3 months	16 weeks	
..	24 weeks	No	25 weeks due to procurement of equipment in piece meal	..	10 months due to unexpected blowdusts in intake.	..	..	Yes	
..	Yes	No	3 weeks due to material distributinn like cyclonic, weather etc.	..	Overall delay 10 months.	26 weeks delay in FE release.	Delay in offloading nf control valves at Karachi Delay in DGS&D Procedure in Issuing I/L, L/C. etc.		

Appendix

S. No.	Particulars	Teesmbay	Satpura	Korba	Neyveli	Kalakote	Garo Hills	Chandrapura
14	*Fund Allotment*							
	(i) *Fund required* (Rs. in lakhs)							145 (upto 31-3-61)
	1961-62	..	..	100	..	..	..	505
	62-63			100·36	17·29		1·37	1065
	63-64			900	114·89		4·11	780
	64-65			492	705·26		24·28	265
	65-66			260	868·40		32·0	125
	66-67						96·0	
	67-68							
	(ii) *Fund allotted* (Rs. in lakhs)							201·64*
	1961-62	2	73·59	111·85	..	2·22	10·0	469·50
	62-63	131	300·90	415·83	17·29	35	10·0	740·89
	63-64	909	518·32	850	114·89	90	20·0	883·49
	64-65	242	885	537·41	705·26	186	50·0	518·98
	65-66	34	1098·82	469·27	868·40	166	42·0	111
	66-67						20·0	
	67-68							
	(iii) Actual expenditure (Rs. in lakhs)							184·60*
	1961-62	2	81·91	111·85	18·40	1·16	8·4	481·44
	62-63	109	255·21	434·07	89·60	11·16	7·77	729·61
	63-64	651	552·44	862·04	640·34	82·98	34·9	920·95
	64-65	396	692·90	733·76	864·40	126	37·6	339·39
	65-66	43	818·75	562·02		163	31·6	91·63
	66-67	117						
	67-68							

6—concld.

Durgapur (WB)	Durgapur (DVC)	Indraprastha	Ramagundam	Obra	Bandel	Dhuvaran	Talcher	Patratu	Remarks
								(Rs. in crores)	
..	..	..	..	..	..				
	33								
	77								
	500							16·00	
	400							11·17	
	130								
	32								
							F. T.		P. Power Station. T. Transmission.
					(Rs. in crores)				
479·21**	2·04	60·10	..	..		79·45	88·04 ..	1·00	
327·68	33·26	263·00	..		5·46	13·73	122·76 12·00	3·99	
109·18	51·46	515·20	82·34		10·17	6·88	503·59 90·00	8·00	
108·98	457·98	613·40	42·24		7·23	4·088	1070·48 114·00	13·30	
187·94	608·22	161·30	90·09		6·33	2·816	934·08 232·00	8·33	
	300								
					(Rs. in crores)				
479·21**	0·05	60·00		..		79·45	20·14 0·42	0·9412	
327·68	14·75	166·40			4·92	13·73	69·66 5·19	4·09	
109·18	89·57	97·59**DC	82·34		15·68	6·88	110·41 15·70	9·48	
108·98	320·35	135·70	42·24		4·96	4·088	913·7 95·69	15·21	
187·94	693·14	195·23	90·09		2·08	2·816	734·72 151·64	9·7589	
	..								
		**105·31 FC							
		120·94 FC							

Appendix

PROCUREMENT SCHEDULE FOR

Sl. No.	Name of Project	Particulars	Date	Preparation of Specs.	Approval of Specification by Consultants	Issue of Tender Specs. & Issuing Authority	Terminal Date for Receipt of Tenders
1	TROMBAY THERMAL POWER STATION UNIT NO. 4.	Turbogenerator & Aux. . .	Target	1-10-61	15-11-61	15-12-61	8-2-62
			Actual	29-9-61	15-11-61	18-12-61	15-2-62
		Boiler & Aux. . . .	Target	1-10-61	15-11-61	1-12-61	19-2-62
			Actual	22-9-61	27-10-61	11-12-61	13-3-62
		Condenser & Access . .	Target	1-10-61	1-3-62	1-4-62	25-5-62
			Actual	29-9-61	15-2-62	11-4-62	15-6-62
		Boiler Feed Equipment . . .	Target	1-5-62	1-6-62	1-7-62	29-8-62
			Actual	4-5-62	1-6-62	17-7-62	21-9-62
		Feed Water Heaters . .	Target	1-8-62	20-8-62	1-9-62	5-11-62
			Actual	2-8-62	27-8-62	12-9-62	14-11-62
		Structural steel . . .	Target	1-11-62	..	1-11-62	21-12-62
			Actual	8-11-62	..	8-11-62	28-12-62
		Power Plant Piping . . .	Target	1-11-62	1-12-62	25-1-63	27-2-63
			Actual	6-11-62	14-12-62	25-1-63	25-6-63
		Coal Handling Equipment .	Target	1-8-62	..	1-8-62	14-9-62
			Actual	23-7-62	..	23-7-62	21-9-62
		Water Treatment Plant . .	Target	19-10-62	15-11-62	15-12-62	8-2-63
			Actual	19-10-62	13-11-62	17-12-62	4-3-63
		Transformer equipment . .	Target	1-10-62	..	1-10-62	28-9-62
			Actual	24-8-62	..	24-8-62	19-10-62
		Switching & Control Eqpt. .	Target	1-11-62	..	1-11-62	4-1-63
			Actual	30-10-62	..	30-10-62	28-1-63
		Power & Control cables . .	Target	1-3-63	..	1-3-63	3-1-63
			Actual	23-11-62	..	23-11-62	27-2-63
		Instruments & Control (BTG & other Control Boards).	Target	1-1-63	..	1-1-63	12-3-63
			Actual	11-1-63	..	29-1-63	12-3-63
		Construction tools . . .	Target	..	..	..	..
2	SATPURA THERMAL POWER STATION.	Turbogenerator & Aux. . .	Target	Bulk purchase.	Bulk purchase.	18-9-61	15-12-61
		Boiler & Aux.	Target	..	..	..	..
		Condenser & Access . .	Target	20-2-63	18-3-63	17-7-63	8-11-63
			Actual				
		Boiler Feed Equipment . .	Target	..	..	..	..
			Actual	Bulk purchase.	Bulk purchase.	9/61	27-12-61
		Feed Water Heaters . .	Target	..	..	..	..
			Actual	Bulk purchase.	Bulk purchase.	25-4-63	22-5-63
		Structural steel . . .	Target	..	..	..	..
			Actual	..	..	..	..

6A

THERMAL POWER STATIONS

Finalisation & Recommendation of Tender	Issue of Letter of Intent	Submission of application for Import Licence	Release of foreign exchange by Min. of Finance	Issue of Import licence	Opening of letter of commitment if required	Manufacture/ Delivery of equipment started	Remarks
1-6-62 24-5-62	10-6-62 13-6-62	25-6-62 25-6-62	.. 10-9-62	.. 21-9-62	.. 13-2-63	1-11-63 20-3-63	
1-6-62 24-5-62	10-6-62 13-6-62	25-6-62 25-6-62	.. 10-9-62	.. 20-9-62	.. 28-1-62	1-6-63 4-6-63	
1-8-62 27-7-62	10-8-62 13-8-62	25-8-62 12-9-62	.. ..	.. 29-12-62	.. 12-2-63	1-10-63 26-6-64	
20-11-62 20-11-62	27-11-62 27-11-62	10-12-62 3-12-62	.. 27-2-63	.. 12-3-63	.. 12-2-63	1-2-64 10-7-64	
3-1-63 3-1-63	10-1-63 10-1-63	20-1-63 24-1-63	.. 28-3-63	.. 20-4-63	.. 24-6-63	31-12-63 25-5-64	
5-1-63 5-1-63	15-2-63 27-2-63	15-2-63 1-2-63	.. 28-3-63	.. 10-5-63	.. 6-8-63	1-9-63 2-6-64	
4-7-63 4-7-63	11-7-63 11-7-63	20-7-63 17-7-63	.. 11-9-63	.. 5-10-63	.. 6-8-63	1-1-64 5-7-64	
6-11-63 6-11-63	15-11-62 15-11-62	25-11-62 26-11-62	.. 27-2-63	.. 12-3-63	.. 6-8-63	1-1-64 16-5-64	
9-8-63 9-8-63	26-8-63 26-8-63	10-9-63 10-9-63	.. 8-10-63	.. 8-11-63	.. 8-10-63	1-6-64 13-6-64	
6-11-62 6-11-62	3-12-62 3-12-62	30-11-62 29-11-62	.. 25-2-63	.. 12-3-63	.. 12-2-63	1-1-64 12-6-64	
10-4-63 10-4-63	29-4-63 29-4-63	25-4-63 26-4-63	.. 28-6-63	.. 11-7-63	.. 29-8-63	1-3-64 17-7-64	
11-6-63 11-6-63	2-7-63 2-7-63	25-6-63 25-6-63	.. 2-8-63	.. 14-8-63	.. 29-8-63	1-11-63 15-6-64	
17-4-63 17-4-63	26-4-63 26-4-63	7-5-63 7-5-63	.. 16-9-63	.. 29-11-63	.. 6-8-63	1-5-64 1-8-64	
..	..	25-6-63	1-8-63	8-8-63	..	1-9-63	
..	7-12-62	..	10-12-62	N.A.	N.A.	Unit 1 — 11/63 Unit 2 — 5/64 Unit 5 — 12/64 Unit 3 — 9/64 Unit 4 — 11/64	
..	*1 20-7-62 *2 & 3 22-8-62 *4 & 5 16-10-62	..	..	..	..	*1-1/64; 2-4/64 *3-7/64; 4-10/64 *5-1/65	* = Unit
15-2-64	30-6-64	16-5-64	27-6-64	N.A.	29-9-64	1/65—9/65 8/65—1/66	
..	25-4-63	..	15-12-62	N.A.	N.A.	2/64	
..	4-9-63 11	..	16-8-63	N.A.	N.A.	4/64	
..	..	..	..	..	..	..	

Appendix

Sl. No.	Name of Project	Particulars	Date	Preparation of Specs.	Approval of Specification by Consultants	Issue of Tender Specs. & Issuing Authority	Terminal Date for Receipt of Tenders
		Power Plant piping . . .	Target	..	..	..	..
			Actual	28-5-63	3-6-63	30-8-63	4-12-63
		Coal Handling Equipment .	Target	..	..	..	..
			Actual	13-5-63	11-6-63	8-5-63	29-11-63
		Water Treatment Plant . .	Target	..	..	..	..
			Actual	18-5-63	10-6-63	6-8-63	12-11-63
		Transformer Equipment .	Target	..	..	..	..
			Actual	4-6-63	27-6-63	13-8-63	28-11-63
		Switching & Control Eqpt. .	Target	..	..	..	..
			Actual	10-6-63	27-6-63	10-10-63	11-2-64
		Power and Control Cables .	Target	..	..	..	..
			Actual	..	..	..	..
		Instruments & Control (BTG & other Control Boards).	Target	..	..	..	..
			Actual	29-6-63	31-8-63	8-11-63	5-2-64
		Construction tools . .	Target	..	..	..	..
			Actual	8-3-63	29-4-63	11-9-63	5-11-63
		Power House Crane . .	Target	..	..	..	..
			Actual	18-3-63	18-4-63	18-7-63	25-9-63
3	KORBA 200 MW THERMAL POWER STATION.	Turbogenerator & Aux. . .	Target	3/62	4/62	..	..
			Actual	..	..	..	..
		Boiler & Aux. . . .	Target	3/62	4/62	..	..
			Actual	..	..	..	..
		Condenser & Access . .	Target	..	..	..	..
			Actual	3/62	4/62	..	..
		Boiler Feed Equipment . .	Target	..	..	..	..
			Actual	3/62	4/62	..	..
		Feed Water Heaters . .	Target	3/62	4/62	..	..
			Actual	..	..	..	..
		Structural Steel . . .	Target	..	..	..	..
			Actual	..	..	..	..
		Power Plant Piping . . .	Target	..	..	..	..
			Actual	3/62	4/62	..	..
		Coal Handling Equipment .	Target	..	..	..	..
			Actual	3/62	4/62	..	..
		Water Treatment Plant . .	Target	..	..	..	..
			Actual	3/62	4/62	..	..
		Transformer Equipment . .	Target	..	..	..	..
			Actual	3/62	4/62	..	..
		Switching & Control Eqpt. .	Target	..	..	..	..
			Actual	3/62	4/62	..	..
		Power & Control Cables .	Target	..	..	..	..
			Actual	3/62	4/62	..	..

6A—*contd.*

Finalisation & Recommendation of Tender	Issue of Letter of Intent	Submission of application for Import Licence	Release of foreign exchange by Min. of Finance	Issue of Import Licence	Opening of Letter of commitment if required	Manufacture/ Delivery of equipment started	Remarks
..	..	..	..	..	..	..	
..	12-2-64	15-2-64	8-9-64	N.A.	8-9-65	10-2-66 to 12/66	
..	..	..	..	..	..	4/65; 11/65	
4-4-64	28-11-64	26-10-64	17-11-64	N.A.	1-4-66	8/65; 11/66	
..	..	..	..	..	..	2/65—4/65	
22-1-64	30-6-64	19-3-64	8-9-64	N.A.	..	5/65—9/65	
..	..	..	..	..	..	..	
5-2-64	14-5-64	28-4-64	27-4-64	N.A.	5-1-65	3/65 to 1/66	
..	..	..	..	..	..	5/65	
25-5-64	9-10-64	25-8-64	30-9-64	N.A.	..	11/65 to 11/66	
..	..	..	..	..	..	..	
..	..	..	..	..	..	..	
..	..	..	..	..	..	9/65	
23-4-64	6-11-64	23-6-64	25-7-64	N.A.	12-3-65	4/66 to 12/66	
..	..	..	..	..	..	..	
31-12-63	17-4-64	17-2-64	10-3-64	N.A.	N.A.	6/64 to 10/64	
..	..	..	..	..	..	3/65	
12-2-64	22-5-64	9-3-64	2-4-64	N.A.	8-1-65	7/65	
..	10-8-62	22-8-62	26-7-62	1-10-62	25-8-62	IV quarter '62 to	
..	..	..	..	..	..	end of 65	
..	10-8-62	22-8-62	26-7-62	1-10-62	25-8-62	IV quarter '62 to	
..		..	..	..	..	end of 65.	
..	..	..	..	..	..	..	
..	10-8-62	22-8-62	26-7-62	1-10-62	25-8-62	IV quarter '62 to	
						end of 65.	
..	..	..	..	..	..	..	
..	10-8-62	22-8-62	26-7-62	1-10-62	25-8-62	IV quarter '62 to	
						end of 65.	
..	10-8-62	22-8-62	26-7-62	1-10-62	25-8-62	IV quarter '62 to	
..	..	..	..	..	..	end of 65.	
..	..	..	..	..	..		
..	10-8-62	22-8-62	26-7-62	1-10-62	25-8-62	IV quarter '62 to	
..						end of 65.	
..	10-8-62	22-8-62	26-7-62	1-10-62	25-8-62	IV quarter '62 to	
..						end of 65.	
..	10-8-62	22-8-62	27-7-62	1-10-62	25-8-62	IV quarter '62 to end	
..						of 65.	
..	10-8-62	22-8-62	26-7-62	1-10-62	25-8-62	IV quarter '62 to	
..						end of 65.	
..	10-8-62	22-8-62	26-7-62	1-10-62	25-8-62	IV quarter '62 to	
..						end of 65.	
..	10-8-62	22-8-62	26-7-62	1-10-62	25-8-62	IV quarter '62 to	
..						end of 65.	

Appendix

Sl. No.	Name of Project	Particulars	Date	Preparation of Specs.	Approval of Specifications by Consultants	Issue of Tender Specs. & Issuing Authority	Terminal Date for Receipt of Tenders
		Instruments & Control (BTG & other Control Boards).	Target	..	..	..	..
			Actual	3/62	4/62	..	..
		Construction Tools. . .	Target	..	..	..	..
			Actual	..	..	..	..
6	5 MW GARO HILLS THERMAL POWER PROJECT.	Turbogenerator & Aux. . .	Target	..	..	1/62	3/62
			Actual	..	..	6/62	9/62
		Boiler & Aux. . . .	Target	..	..	3/62	7/62
			Actual	..	..	5/63	8/63
		Condenser & Access . .	Target	..	..	..	..
			Actual	..	..	..	..
		Boiler Feed Equipment . .	Target	..	..	..	..
			Actual	..	..	..	..
		Feed Water Heaters . .	Target	..	..	..	..
			Actual	..	..	..	..
		Structural Steel . . .	Target	..	..	..	..
			Actual	..	..	..	..
		Power Plant Piping . . .	Target	..	..	4/64	6/64
			Actual	..	..	7/66	8/66
		Coal Handling Equipment .	Target	..	..	..	..
			Actual	..	..	..	..
		Water Treatment Plant . .	Target	..	..	2/62	5/62
			Actual	..	..	10/64	12/64
		Transformer Equipment . .	Target	..	..	12/62	2/62
			Actual	..	..	2/63	4/63
		Switching & Control Eqpt.	Target	..	..	12/62	2/63
			Actual	..	..	1/64	4/64
		Power & Control Cables .	Target	..	..	12/62	2/62
			Actual	..	..	1/64	3/64
		Instruments & Controls (BTG & other Control Boards).	Target	..	..	12/62	2/62
			Actual	..	..	1/64	3/64
		Construction Tools. . .	Target	..	..	12/61	2/62
			Actual	..	..	1/64	4/64
7	CHANDRAPURA THERMAL POWER STATION UNITS I, II.	Turbogenerator & Aux. . .	Target	..	..	..	..
			Actual	11/58	..	1/59	5/59
		Boiler & Aux. . . .	Target	..	..	..	..
			Actual	11/58	..	1/59	5/59
		Condenser & Access . .	Target	..	..	..	..
			Actual	6/60	..	7/60	10/60
		Boiler Feed Equipment . .	Target	..	..	..	..
			Actual	10/60	..	1/60	3/61
		Feed Water Heaters . .	Target	..	..	..	..
			Actual	8/60	..	8/60	12/60
		Structural Steel . . .	Target	..	..	..	..
			Actual	..	..	..	..
		Power Plant Piping . . .	Target	5/61	..	7/61	10/61
			Actual	11/61	..	11/61	3/62

6A—*contd*

Finalisation and Recommendation of Tender	Issue of Letter of Intent	Submission of application for Import Licence	Release of foreign exchange by Min. of Finance	Issue of Import Licence	Opening of letter of commitment if required	Manufacture/ Delivery of equipment started	Remarks
..	..	..	..	..	..		
..	10-8-62	28-8-62	26-7-62	1-10-62	25-8-62	IV quarter to end of 65.	
..	..	..	..	..	..		
..	..	..	..	..	..		
5/62	6/62	1/62	8/62	10/62	..	7/64	
11/62	12/62	1/63	8/63	12/63	..	2/66	
10/62	11/62	1/62	6/63	8/63	..	4/64	
9/63	9/63	12/63	1/65	2/65	..	1/66	
..	..	..	..	..	..	..	
..	..	..	..	..	..	..	
..	..	..	..	..	..	..	
..	..	..	..	..	..	..	
..	..	..	..	..	..	..	
..	..	..	..	..	..	..	
..	..	..	..	..	..	..	
..	..	..	..	..	..	..	
7/64	7/64	..	..	..	..	9/65	
..	..	..	..	..	..	..	
..	..	..	..	..	..	..	
..	..	..	..	..	..	..	
7/62	8/62	..	..	..	..	4/64	
1/65	2/65	..	..	..	..	1/66	
4/62	5/62	..	..	..	..	7/64	
8/63	8/63	..	..	..	..	10/66	
4/63	5/63	8/63	10/63	..	..	3/64	
4/64	5/64	5/64	..	..	..	5/65	
2/62	3/62	..	..	..	..	7/64	
6/64	6/64	..	..	..	..	7/65	
2/62	3/62	..	..	..	..	7/64	
6/64	6/64	..	..	..	..	7/65	
5/62	6/62	..	..	..	..	3/64	
6/64	6/64	..	..	..	..	7/65	
..	..	..	..	..	..	10/61	
10/59	5/60	12/59	12/59	12/59	..	3/62	
..	3/61	..	9/59	..	..	2/63	
12/59	9/60,3/61	9/60	11/60	1/61	..	6/63	
4/61	9/61	4/61	4/61	5/61	..	10/62	
3/61	8/61	..	7/61	..	..	6/63	
5/61	10/61	8/61	8/61	9/61	..	4/63	
8/61	10/61	9/61	11/61	12/61	..	11/63	
4/61	9/61	6/61	6/61	..	..	12/62	
6/61	10/61	..	8/61	..	..	2/64	
..	..	..	..	..	..		
..	..	..	..	..	..	..	
12/61	5/62	9/62	9/62	10/62	..	3/63	
8/62	8/62	10/62	9/62	12/62	..	7/64	

Appendix

Sl. No.	Name of Project	Particulars	Date	Preparation of Specs.	Approval of Specification by Consultants	Issue of Tender Specs. & Issuing Authority	Terminal Date for Receipt of Tenders
		Coal Handling Requirement	Target	2/61	..	4/61	7/61
			Actual	9/61	..	10/61	2/62
		Water Treatment Plant . .	Target	3/61	..	5/61	8/61
			Actual	8/61	..	9/61	1/62
		Transformer Equipment .	Target	..	..	..	..
			Actual	6/60	..	6/60	9/60
		Switching & Control Eqpt. .	Target	4/61	..	6/61	9/61
			Actual	12/61	..	1/62	3/62
		Power & Control Cables. .	Target	3/61	..	5/61	8/61
			Actual	12/61	..	1/62	3/62
		Instruments & Controls (BTG & other Control Boards).	Target	4/61	..	6/61	9/61
			Actual	1/62	..	1/62	4/62
		Construction Tools. . .	Target	..	..	..	..
			Actual	..	..	..	..
8	DURGAPUR PROJECTS POWER STATION (2nd STAGE EXTENSION).	Construction Machinery	Target	The tools and tackles required for erection			
			Actual				
		Turbogenerator & Auxiliaries, step up station equipment, water treatment plant, Power House Crane, Power Station Switch & Control Gear, Power Station piping & electricals as covered by items 10.2, 10.4, 10.6, 10.7, 10.8, 10.9 & 10.10 in the questionnaire.	Target	..	..	..	..
			Actual	30-10-59	Nov' 59	24-12-59 (D.P. Ltd.)	30-4-60
		Boiler & Auxiliaries & Coal Handling system covered by items 10.3 & 10.5 in the questionnaire.	Target	..	..	..	..
			Actual	30-10-59	Nov' 59	24-12-59 (D.P. Ltd.)	30-4-60
9	DURGAPUR THERMAL POWER STATION DVC THIRD UNIT.	Turbogenerator & Aux. . .	Target	8/61	..	9/61	2/62
			Actual	8/61	8/62	8/61	2/62
		Boiler & Aux. . . .	Target	8/61	..	9/61	2/62
			Actual	8/61	8/62	8/61	2/62
		Condenser & Access . .	Target	7/62	..	8/62	11/62
			Actual	2/62	..	2/62,11/63, 10/62	1/62,1/64, 1/63
		Boiler Feed Equipment . .	Target	10/62	..	11/62	2/63
			Actual	8/62	..	9/62	2/63
		Feed Water Heaters . .	Target	10/62	..	11/62	2/63
			Actual	10/62	..	11/63	12/63
		Structural Steel . . .	Target	..	..	..	..
			Actual	..	..	..	..
		Power Plant Piping . .	Target	9/63	..	10/63	1/64
			Actual	7/63	11/63	8/63	12/63
		Coal Handling Equipment .	Target	11/63	..	12/63	3/64
			Actual	11/63	..	11/63	3/64
		Water Treatment Plant . .	Target	8/63	..	9/63	12/63
			Actual	5/63	7/63	5/63,2/64	9/63,3/64

6A—contd.

Finalisation and recommendation of tender	Issue of Letter of Intent	Submission of application for Import licence	Release of foreign exchange by Min. of Finance	Issue of Import Licence	Opening of letter of commitment if required	Manufacture/ Delivery of equipment started	Remarks
9/61	2/62	7/62	7/62	8/62	..	2/63	
7/62	8/62	9/62	8/62	9/62	..	4/64	
10/61	3/62	6/62	6/62	7/62	..	2/63	
4/62	6/62	6/62	7/62	8/62	..	3/64	
..	6/61	4/61	4/61	5/61	..	11/61	
6/61	7/61	..	6/61	..	..	11/62	
11/61	4/62	10/62	10/62	11/62	..	6/63	
7/62	9/62	..	11/62	..	..	3/64	
10/61	3/62	10/62	10/62	11/62	..	2/63	
9/62	12/62	2/63	11/62	2/63	..	7/64	
11/61	1/62	10/62	10/62	11/62	..	3/63	
8/62	11/62	..	10/62	..	..	6/64	
..	..	..	..	..	..	..	Major Construction Equipment was transferred from DVC Project 12/62.
..	..	..	..	..	..	..	
of the plant were imported against a CCP.							
..	..	..	..	..	Not reqd.	30/32 months	Contract execution time reckoned from date of Import Licence.
Aug. 60	19-9-60	24-10-60	30-1-61	4-2-61	..	38 months	
..	..	..	..	..	Not reqd.	30/32 months	Contract execution time reckoned from date of Import Licence.
Aug. 60	19-9-60 & 3-11-62	24-10-60	11-1-61	20-1-61	..	38 months	
1/62	10-62	7/62	9/62	10/62	2/63	11/64, 1/65	
8/62	1/63	9/62, 3/63	1/63	4/63	4/64	3/65, 4/66	
1/62	10/62	7/62	9/62	10/62	2/63	4/64, 8/65	
8/62	2/63	9/62, 3/63	1/63	4/63	7/64	4/64, 4/66	
2/63	6/63	3/63	5/63	6/63	10/63	8/64, 12/64	
2/63, 1/64, 5/63	7/63, 2/64	3/63, 1/64	7/63, 2/64	4/64	8/64	12/64, 11/65	
5/63	9/63	6/63	8/63	9/63	1/64	2/65, 6/65	
1/63	12/63	8/63	11/63	12/63	8/64	7/65, 9/65	
4/63	8/63	5/63	7/63	8/63	12/63	10/64, 1/65	
12/63	10/63, 1/64	7/63 12/63	9/63, 1/64	10/63	8/64	5/65	
..	..	..	..	..	..	..	
4/64	8/64	5/64	7/64	8/64	..	5/65, 12/65	
3/63	6/64	3/64	7/64	12/64	..	7/65, 6/66	
6/64	10/64	7/64	9/64	10/64	..	6/65, 11/65	
6/64	10/64	6/64	10/64	11/64	..	4/65, 12/65	
3/64	7/64	4/64	6/64	7/64	..	5/65, 9/65	
4/64	7/64	4/64	6/64	6/64	..	12/65, 7/66	

Appendix

Sl. No.	Name of Project	Particulars	Date	Preparation of Specs.	Approval of Specification by Consultants	Issue of Tender Specs. & Issuing Authority	Terminal Date for Receipt of Tenders
		Transformer Equipment .	Target	11/62	..	12/62	3/63
			Actual	6/62	8/62	6/62	10/62
		Switching & Control Eqpt. .	Target	8/62	..	9/62	12/62
			Actual	7/62	8/62	7/62	11/62
		Power & Control Cables .	Target	12/62	..	1/63	11/62
			Actual	8/62	..	9/62	11/62
		Instruments & Controls (BTG & other control Boards).	Target	11/63	..	12/64	3/64
			Actual	2/64	..	2/64	6/64
		Construction Tools. . .	Target	..	..	..	..
			Actual	4/63	7/62	5/63	..
10	INDRAPRASTHA STATION EXTENSION PROJECT.	Turbogenerator & Aux. . .	Target	..	..	..	..
			Actual	3/61	..	18-9-61	15-12-61
		Boiler & Aux. . . .	Target	..	..	..	..
			Actual	..	..	..	..
		Condenser & Access . .	Target	..	..	..	..
			Actual	6-12-65	..	11-3-64	25-8-64
		Boiler Feed Equipment . .	Target	..	..	..	..
			Actual	3/61	..	9/61	27-12-61
		Feed Water Heaters . .	Target	..	..	..	..
			Actual	3/61	..	25-4-63	22-5-63
		Structural Steel . . .	Target	..	..	..	..
			Actual	..	..	16-8-63	31-12-63
		Power Plant Piping . . .	Target	..	..	..	..
			Actual	13-7-64	..	1-9-64	2-12-64
		Coal Handling Equipment .	Target	..	..	..	..
			Actual	11-10-63	..	..	18-9-64
		Water Treatment Plant . .	Target	..	..	..	..
			Actual	..	..	..	..
		Transformer equipment . .	Target	..	..	..	..
			Actual	..	..	16-10-64	15-1-65
		Switching & Control Eqpt. .	Target	..	..	..	..
			Actual	13-7-64	..	1-9-64	2-12-64
		Power & Control Cables. .	Target	..	..	..	..
			Actual	..	..	27-10-64	29-1-65
		Instruments & Controls (BTG & other Control Boards).	Target	..	..	..	..
			Actual	9-10-63	..	1-9-64	30-12-64
		Construction Tools. . .	Target	..	..	..	..
			Actual	..	..	..	..
11	RAMAGUNDAM THERMAL SCHEME STAGE II	Turbogenerator & Aux. . .	Target	..	..	..	..
			Actual	..	..	..	..
		Boiler & Aux. . . .	Target	10/63	11/63	D.G.S. & D.	..
			Actual	18-10-63	14-11-63	23-11-63	6-3-64

6A—*contd.*

Finalisation & Recommendation of Tender	Issue of letter of Intent	Submission of application for Import Licence	Release of foreign exchange by Min. of Finance	Issue of import licence	Opening of letter of commitment if required	Manufacture/ Delivery of equipment started	Remarks
6/63	10/63	7/63	9/63	10/63	..	7/65	
3/63	8/63	5/63	8/63	8/63	..	2/65	
5/63	7/63	4/63	5/63	7/63	11/63	6/65	
4/63	10/63	5/63	8/63	9/63	1/65	10/65	
8/63	11/63	8/63	10/63	11/63	..	2/65, 10/65	
8/63	9/63, 2/64	9/63	1/64	2/64	..	5/65, 9/65	
6/64	10/64	7/64	9/64	10/64	2/65	6/65, 9/65	
9/64	12/64	9/64	10/64	10/64	12/65	1/66, 4/66	
..	..	..	..	..	..	..	
12/63	7/64, 8/64	3/64	6/64, 8/64	7/64, 8/64	..	12/64, 12/65	
..	..	..	..	..	..	..	
..	7-12-62	..	10-12-62	..	..	..	
..	..	..	..	..	..	..	
..	30-3-63	..	..	..	..	..	
..	..	..	..	..	..	..	
28-9-64	2-12-64	..	24-11-64	..	15-4-65	15-2-66	
..	..	..	..	..	..	..	
..	25-4-63	..	15-12-62	..	..	..	
..	..	..	..	..	..	..	
..	4-9-63	..	6-8-63	..	..	..	
..	..	..	..	..	..	..	
16-1-64	10-2-64	..	..	..	20-3-64	7/64 to 3/65	
..	..	..	..	..	..	..	
8-1-65	31-5-65	..	..	..	8-11-65	23-12-65	
..	..	..	..	..	..	..	
30-11-64	11-8-65	..	6-8-65	..	11-7-66	..	
..	..	..	..	..	..	..	
..	..	..	..	..	..	..	
..	..	..	..	..	..	..	
11-3-65	25-5-65	..	6-5-65	..	14-9-65	31-3-66	
..	..	..	..	..	..	..	
8-1-65	31-5-65	..	..	..	8-11-65	23-12-65	
..	..	..	..	..	..	..	
29-6-65	30-6-65	..	7-6-65	..	29-11-65/ 28-12-65	1-4-66	
..	..	..	..	..	..	..	
15-2-65	29-4-65	..	..	..	..	15-6-66	
..	..	..	..	..	..	..	
..	..	..	..	..	..	..	
..	..	..	..	..	..	2/64	Procured under 'Bulk Purchase' by Government of India & allotted to Ramagundam Project AID Unit.
..	..	..	..	..	..	12/63	
..	4/64	..	..	..	..	1-3-65 as per contract 11 to 17 months. Delivery period extended upto 30-4-67.	There is a delay of about 1½ year in finalisation of contractory by D.G.S. &D.
21-4-64	12-3-65	..	27-6-64	..	..		

Appendix

Sl. No.	Name of Project	Particulars	Date	Preparation of Specs.	Approval of Specification by Consultants	Issue of Tender Specs. & Issuing Authority	Terminal Date for Receipt of Tender
		Condenser & Access. . .	Target Actual	12/63 27-12-63	1/64 18-1-64	.. 3-2-64	.. 30-4-64
		Boiler Feed Equipment . .	Target Actual	.. ..	.. ..	.. ..	.. ..
		Feed Water Heaters . .	Target Actual	.. ..	.. ..	.. ..	.. ..
		Structural Steel . . .	Target Actual	.. ..	.. ..	.. ..	.. ..
		Power Plant Piping . .	Target Actual	3/64 6-12-65	4/64 4-4-66	.. 14-4-64 D.G.S. & D.	.. 15-12-66
		Coal handling Equipment .	Target Actual	2/64 ..	3/64 ..	.. ..	.. ..
		Water Treatment Plant . .	Target Actual	2/64 25-5-64	3/64 22-6-64	.. 14-7-64 D.G.S. & D.	.. 24-9-64
		Transformer Equipment . .	Target Actual	2/64 9-4-64	3/64 15-5-64	30-5-64 D.G.S. & D.	.. 11-8-64
11	RAMAGUNDAM THERMAL SCHEME STAGE II.	Switching & Control Equipment	Target Actual	3/64 ..	4/64 5-10-64	.. 28-11-64 D.G.S. & D.	.. 20-3-65
		Power & Control Cables. .	Target Actual	5/64 21-1-65	6/64 31-3-65	.. 8-7-65 D.G.S. & D.	.. 6-10-65
		Instruments & Controls (BTG & other Control Boards).	Target Actual	5/64 ..	6/64 ..	.. ..	.. ..
		Construction Tools. . .	Target Actual	.. ..	.. ..	.. ..	.. ..
		Power Station Switch & Control Gear Switch Gear 3·3 KV.	Target Actual	6/64 ..	7/64 21-10-64	.. 12-11-65 D.G.S. & D.	.. 2-2-66
		Power House Crane .	Target Actual	3/64 9-3-64	4/64 9-4-64	.. 22-4-64 D.G.S. & D.	.. 3-7-64

6A—contd.

Finalisation & Recommendation of Tender	Issue of letter of Intent	Submission of application for Import Licence	Release of foreign exchange by Min. of Finance	Issue of import licence	Opening of letter of commitment if required	Manufacture/ Delivery of equipment started	Remarks
..	6/64	..	..	..	..	Shipped in Jan. 66 except condensate pumps	
15-6-64	22-10-65	..	..	..	..		
..	..	..	..	..	..	10/63	Procured under 'Bulk Purchase' by Government of India & allotted to Ramagundam Project AID. Unit.
..	..	..	..	..	..	9/64	Do.
..	..	..	..	..	..	..	
..	..	..	..	..	..	..	
..	..	..	..	..	..	..	
..	10/64	..	..	..	..	3/63	Tenders called for and the original due date for opening tenders was 9-8-66. Since no bid was received the due date is extended upto 15-12-66.
..	..	..	..	..	..	..	
..	9/64	..	..	..	..	4/65	
..	18-5-66, 30-6-66	..	..	..	..	Supply & erection within 12 months.	
..	9/64	..	..	..	..	5/65	
17-3-65	19-4-65	..	26-3-65	..	..	1/66	
..	..	..	..	..	..	8/65	
8-12-64	(a) 1-11-65 for 15 MVA & 40 MVA (b) 15-11-64 for 7·5 MVA Transformer.	1-12-64				(a) 5/67 (b) 6/66	
..	10/64	..	18-8-65	..	17-11-65	9/65	
20-5-65	27-9-65	..	..	..	..	2/67	
..	12/64	..	19-2-66	..	..	10/66 to	
25-11-65	5-3-66, 4-4-66	..	..	..	..	3/67	
..	12/64	..	..	..	..	8/65	Specifications received from the Consultants have been finalised and they will be sent to D.G.S.&D. shortly.
..	..	..	..	..	..	..	
..	..	..	..	..	..	..	Construction machinery necessary for this project is diverted from other projects as and when necessary.
..	1/65	..	..	..	..	7/65	
..	27-7-66	..	..	..	..	8/67	
..	10/64	..	..	..	..	5/65	
5-12-64	9-3-65	..	1-2-65	..	..	6/65	

Appendix

Sl. No.	Name of Project	Particulars	Date	Preparation of Specifications by Consultants	Approval of Specifications by Project authority	Issue of Tender Specs. & issuing authority	Terminal Date for Receipt of Tenders
12	OBRA THERMAL POWER STATION	*Construction Equipment :*					
		Bull Dozers, Trailors, Wire Ropes etc.	Target Actual	.. ..	.. ..	.. ..	.. ..
		30 tonnes Gantry Cranes .	Target Actual	.. ..	.. ..	.. ..	.. ..
		50 Tonnes Tower Crane . .	Target Actual	.. ..	.. ..	.. ..	.. ..
		Turbogenerator & Auxiliaries .	Target Actual	.. ..	.. ..	.. ..	.. ..
		Boiler & Auxiliaries .	Target Actual	.. ..	.. ..	.. ..	.. ..
		Step up Station Equipment .	Target Actual	.. ..	.. ..	.. ..	.. ..
		Coal Handling System .	Target Actual	.. ..	.. ..	.. ..	.. ..
		Power House Crane .	Target Actual	.. ..	.. ..	.. ..	.. ..
		Power Station Switch & Control Gear.	Target Actual	.. ..	.. ..	.. ..	.. ..
		Power Station Piping . .	Target Actual	.. ..	.. ..	.. ..	.. ..
		Power & Control Cables .	Target Actual	.. ..	.. ..	.. ..	.. ..
		Heavy Structural Steel . .	Target Actual	.. ..	.. ..	.. ..	.. ..
		Control & Instrumentation .	Target Actual	.. ..	.. ..	.. ..	.. ..
13	BANDEL THERMAL POWER PROJECT	Construction Machinery .	Target	..	..	The Kuljian Corporation as consultant of W.B. S.E.B.	..
			Actual	..	..	10.3.61	5.8.61
		Turbogenerator & Auxiliaries .	Target Actual	.. ..	.. ..	.. Do.	.. 5.8.61
		Boiler and Auxiliaries . .	Target Actual	.. ..	.. ..	.. Do.	.. 5.8.61
		Step up Station Equipment .	Target Actual	.. ..	.. ..	.. Do.	.. 5.8.61
		Coal Handling System . .	Target Actual	.. ..	.. ..	.. Do.	.. 5.8.61

6A—*contd.*

Finalisation & Recommendation of Tender	Issue of letter of Intent	Submission of application for Import Licence	Release of foreign exchange by Min. of Finance	Issue of import licence	Opening of letter of commitment if required	Manufacture/ Delivery of equipment started	Remarks
..	..	..	..	..	..	II to IV quarter'63.	
..	1/63	3/63	4/63	4/63	6/63	7/63 to 12/64.	
..	..	..	..	..	..	I and II quarter '63.	
..	6/63	3/63	5/63	9/63	9/63	12/63 to 6/64.	
..	..	..	..	..	..	III to IV quarter'64	
..	12/63	9/63	1/64	3/64	7/64 to 10/64	10/64	
..	..	..	..	..	..		
..	..	..	..	..	..		
..	..	..	..	..	..	III quarter 64 to	
..	..	..	..	..	..	I quarter 66.	
..	..	..	..	..	..		
..	..	..	..	..	..		
..	..	..	..	..	..	..	
..	5/64	2/64	5/64	6/64	Letter of authority in June 64	First consignment arrived in Sept. 64 and material still coming.	
..	..	..	..	..	..	..	
..	..	..	..	..	..	..	
..	..	..	..	..	..	..	
..	..	..	..	..	..	..	
..	..	..	..	..	..	..	
..	..	..	..	..	..	..	
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..	..	..	..	..	..	..	
..	..	..	..	..	..	..	
..	..	..	..	..	..	..	
..	..	..	..	..	..	..	
..	..	..	..	..	..	..	
11-9-61	16-9-61	18-6-62	1-8-62	3-8-62	13-11-62	..	
..	..	..	..	..	..	S-Dec. '63	
11-9-61	16-9-61	14-2-62	20-2-62	8-5-62	13-11-62	C-Sept. '66	
..	..	..	..	..	..	S-May '63	
11-9-61	16-9-61	14-2-62	20-2-62	8-5-62	13-11-62	C-Nov. '65	
..	..	..	..	..	..	S-Oct. '63	
11-9-61	16-9-61	14-2-62	20-2-52	8-5-62	13-11-62	C-July '64	
..	..	..	..	..	..	S-Feb. '64	
11-9-61	16-9-61	1-2-62	18-6-62	23-7-62	13-11-62	C—	

Appendix

Sl. No.	Name of Project	Particulars	Date	Preparation of Specification by Consultants	Approval of Specification by project authority	Issue of Tender Specifications & the issuing authority	Terminal Date for Receipt of Tenders
		Water Treatment Plant . .	Target	..	..	..	..
			Actual	..	..	Do.	5-8-61
		Power House Crane . .	Target	..	..	..	..
			Actual	..	..	Do.	5-8-61
		Power Station Switch & Control Gear.	Target	..	..	..	..
			Actual	..	..	Do.	5-8-61
		Power Station Piping . .	Target	..	..	..	..
			Actual	..	..	Do.	5-8-61
		Other Electrical Equipments including Power & Control Cable.	Target	..	..	..	..
			Actual	..	..	Do.	5-8-61
14	TALCHER THERMAL POWER-STATION.	Turbogenerator & Aux. . .	Target	..	..	..	..
			Actual	26-12-61	..	..	..
		Boiler & Aux. . .	Target	1-6-62	10-8-62	..	..
			Actual	5-3-62	8-8-62	..	10-10-62
		Condenser & Access. . .	Target	17-9-62	30-11-62	..	15-1-63
			Actual	14-9-62	11-12-62	5-12-62	25-1-63
		Boiler Feed Equipment . .	Target	..	..	..	..
			Actual	26-12-61	..	..	..
		Feed Water Heaters . .	Target	..	..	..	..
			Actual	26-7-62	..	..	..
		Structural Steel . .	Target	..	..	..	..
			Actual	..	..	..	..
		Power Plant Piping . .	Target	29-4-63	10-6-63	D.G.S. & D.	5-8-63
			Actual	20-5-63	16-7-63	18-7-63	4-10-63
		Coal Handling Equipment .	Target	7-7-63	1-9-63	..	1-11-63
			Actual	31-7-63	15-8-63	..	26-11-63
		Water Treatment Plant . .	Target	29-7-63	2-9-63	..	11-11-63
			Actual	25-7-63	5-8-63	31-8-63	17-12-63
		Transformer Equipment .	Target	..	..	..	..
			Actual	9-5-62	..	..	..
		Switching & Control Equpt. .	Target	9-8-63	20-9-63	..	1-11-63
			Actual	10-1-64	..	..	3-3-64
		Power & Control Equipment .	Target	23-8-63	4-10-63	..	1-12-63
			Actual	6-11-63	30-12-63	..	15-4-64 & 30-6-65
		Instruments & Controls (BTG & other Control Boards)	Target	7-7-63	1-9-63	..	1-11-63
			Actual	31-7-63	15-8-63	..	26-11-63
		Construction Tools	Target	..	..	..	..
			Actual	..	..	..	..

6A—*contd.*

Finalisation & recommendation of tender	Issue of letter of intent	Submission of application for import licence	Release of foreign exchange by Min. of Finance	Issue of import licence	Opening of letter of credit if required	Manufacture/ Delivery of Equipment Started	Remarks
..	..	..	..	..	..	S-Feb. '64	
11-9-61	16-9-61	1-2-62	18-6-62	17-9-62	13-11-62	C—	
..	..	..	..	..	..	S-Aug. '63	
11-9-61	16-9-61	14-2-62	20-2-62	8-5-62	13-11-62	C-Dec. 63	
..	..	..	..	..	..	S-July '64	
11-9-61	16-9-61	14-2-62	3-5-62	7-12-62	13-11-62	C—	
..	..	..	..	..	..	S-Sept '63	
11-9-61	16-9-61	14-2-62	20-2-62	8-5-62	13-11-62	C-Sept '66	
..	..	..	..	..	..	S-July '63	
11-9-61	16-9-61	14-3-62	20-2-62	7-12-62	13-11-62	C—	
..	..	..	..	..	..	..	
..	12-7-62	..	10-12-62	..	7-1-63	1-5-64	
..	..	..	21-8-63	..	..	1-8-64	
2-11-62	1-2-63	..	17-9-65	..	23-1-64	..	
22-1-63	1-3-63	..	..	..	..	..	
19-1-63	10-9-63	..	28-8-63	..	11-12-64	1-4-65	
..	..	..	..	..	..	..	
..	25-4-63	..	1-12-62	..	29-5-64	1-8-64	
..	..	..	..	..	..	..	
..	4-9-63	..	20-12-63	..	6-2-64	1-8-64	
..	..	..	..	..	..	..	
..	..	..	..	..	..	..	
2-9-63	7-10-63	..	..	..	..	7-10-64	
27-11-63	30-4-63	23-12-63	21-4-66	16-1-67	22-12-64	..	
15-1-64	1-3-64	..	..	..	..	1-1-65	
21-1-64	30-4-64	..	30-1-64	..	..	..	
21-12-63	6-1-64	..	..	..	..	6-1-65	*7-4-65, 2-7-65, 2-6-65, 22-11-65, 10-11-65, 4-8-66 & 18-10-66.
4-2-64	17-6-64	16-10-64	17-6-64	30-7-65	9-12-66	..	
..	..	..	..	..	..	..	
..	1-4-63	..	..	..	..	24-2-66	
15-11-63	15-1-64,	..	..	..	..	15-11-65	
8-4-64	26-9-64, & 14-7-66	..	1-9-64	..	23-4-65	..	
15-1-64	1-3-64	..	..	..	..	4-10-64	
25-5-64	11-12-64	..	..	..	*	..	
15-1-64	1-3-64	..	..	..	24-8-66 & 26-9-66	7-1-65	
21-1-64	30-4-64	..	24-4-64	..	6-4-65	2/65	

Appendix

Sl. No.	Name of Project	Particulars	Date	Preparation of Specifications	Approval of specification by Consultants	Issue of tender specifications and Issuing Authority	Terminal date for receipt of tenders
15	DHUVARAN PROJECT STAGE I.	Turbo-generator & Auxiliaries	Actual	Specification prepared by BSEB before April ,60	Approved by BSEB before April, 60	ISM Washington issued tendered inquiry in May, 60.	Aug, 60
		Boiler and Auxiliaries . .	Target	..	..	..	..
			Actual	..	..	..	..
		Coal Handling System . .	Target	..	..	..	..
			Actual	..	..	..	..
		Water Treatment Plant . .	Target	..	..	..	..
			Actual	..	..	..	..
		Power House Crane . .	Target	..	..	..	..
			Actual	..	..	..	..
		Power Station Piping . .	Target	..	..	..	..
			Actual	..	..	..	..
		Other Electrical Equipments including Power and Control cables.	Target	..	..	..	..
			Actual	..	..	..	..
		Step up Station Equipment .		..	..	..	..
			Actual	Step up station equipments were ordered			
		Power Station Switch and Control Gear.	Actual	G.E.B.'s Specifications prior to Sept. '61	Prior to to Sept. '61	ISM Washington invited tender Sept. '61	Oct, 61
16	PATRATU THERMAL POWER STATION.	Construction Equipment . .	Target	17-10-61	17-10-61	..	4-11-61
			Actual	..	..	..	..
		Water Treatment Plant . .	Target	11/61	12/61	12/61	12-4-62
			Actual	..	..	..	..
		Turbo-generator and Auxiliaries	Target	..	..	..	..
			Actual	..	..	..	22-5-62
		Boiler and Auxiliary . .	Target	..	..	..	..
			Actual	..	..	..	22-5-62
		Step up Station Equipment .	Target	11/61	12/61	12/61	22-5-62
			Actual	..	..	..	..
		Coal Handling System . .	Target	..	..	..	..
			Actual	..	..	..	..
		Power House Crane . .	Target	..	..	..	..
			Actual	..	..	..	..
		Power Station Switch and control-Gear.	Target	..	..	..	..
			Actual	..	..	..	..
		Power Station Piping . .	Target	..	..	..	..
			Actual	..	..	..	..
		Other Electrical Equipments including Power and Control Cables.	Target	..	..	..	..
			Actual	..	..	..	..

6A—*contd.*

Finalisation and recommendation of tender	Issue of letter of Intent	Submission of application for import licence	Release of foreign exchange by Min. of Finance	Issue of Import licence	Opening of letter of commitment if required	Manufacture delivery of equipment started	Remarks
Oct. '60	Oct. '60	No import licence required because the contract placed by ISM Washington.	Oct. 25 1961	Not required	Letter of credit issued in August, 61	..	
..	..	..	..	..	..	..	
..	..	..	..	..	..	..	
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..	..	..	..	..	..	..	
..	..	..	..	..	..	..	

on various suppliers and equipments were scheduled to be received in line with commissioning schedule of the project.

Feb. 62	Order placed in Feb. 62	Not required	4-10-61	Not required	Letter of credit issued in May, 62.	October, 62.	
5-12-61	..	15-1-62	28-2-62 21-8-62 27-2-63 29-5-63	1-6-62 19-11-62 17-4-63	..	..	
..	..	..	..	..	..	..	
10/62	10-12-62	21-3-63	18-2-63	24-4-63	..	..	
..	..	..	..	..	..	..	
..	..	..	..	..	..	..	
29-8-62	6-9-62	18-9-62, 15-6-63, 1-8-64 & 7-8-64	7-9-62 15-5-63 28-12-64 18-10-65	24-10-62 31-10-63 6-1-65 9-12-65	..	..	
..	..	..	..	..	..	..	
29-8-62	6-9-62	18-9-62, 15-6-63, 1-8-64 & 7-8-64	7-9-62 15-5-63 28-12-64 18-10-65	24-10-62 31-10-63 6-1-65 9-12-65	..	..	
..	..	..	..	..	..	..	
..	..	..	..	..	..	..	
29-8-62	6-9-62	18-9-62, 15-6-63, 1-8-64 & 7-8-64	7-9-62 15-5-65 28-12-64 18-10-65	24-10-62 31-10-63 6-1-65 9-12-65	..	..	
..	..	..	..	..	..	..	
..	..	..	..	..	..	..	
..	..	..	..	..	..	..	
..	..	..	..	..	..	..	

Appendix

COMPILATION OF DATA FOR

Sl. No.	Particulars	Sharavathi	Jaldhaka	R. P. Sagar	Uhl
I	*Type* (Single/Multi purpose) . .	Single Purpose	Single-Generation of power.	Multi-purpose	Single purpose
II	*Single State or Inter-State* . .	Single	Single	Inter-state	Single (Punjab)
III	*Proposed Installed Capacity & Target for completion as per P.R.*	8,91,000 KW 1969-70.	Initial—18 MW ultimate 36 MW 3 years.	172 MW Dec. 1965.	45 MW with a provision for a future 4th unit of 15 MW 3/67.
IV	*Original Project Estimate (Rs.)* . .	Stage I 22·97 crores Stage II 23·80 crores.	445 lakhs	1721·26 lakhs	472·283 lakhs (original) 693·477 lakhs (revised).
V	*Progress at the end of Third Five Year Plan.*				
	(i) Capacity Commissioned .	1,78,200 KW	Nil	Nil	..
	(ii) Dam (Percentage of Work Completed).	Main-90% Subsidiary-100%.	Excavation-77% (concrete) Earth dam-Filling-55·7% Clay filling-27·5% Collection of filter material-100%.	About 90%	No dam involved
	(iii) Water Conductor System .	100% (except for the work, of control arrangement in front of left twin pressure tunnel	R.C.C. dust-100% Head race tunnel-100% Grounding in main tunnel-50%. Surge chamber & main shaft-100%. Press tunnel-100%. Steel liner-31·48%. Steelline in pressure tunnel-66·82%. Penstock-30·8%	Penstrook about 60%	75%
	(iv) Power House . . .	100%	90%	Excavation-95% Concreting-10%	75·0%
VI	*Project Clearance*		..		
	(i) Date of Submission of Project Report.	Stage I 25-10-54 Administrative sanction-2-7-56	..	1958	9-8-1960
	(ii) Advance Action Authorised by P. C. & Date.	..	..	Yes-1958	No.
	(iii) Date of Formal Approval by P.C.	June '56	7-5-59	May '60	20-5-61

7

HYDRO POWER STATIONS

Bhakra R. B.	Koyna Stage (I)	Koyna Stage (II)	Sholayar	Sabarigiri	Remarks
Multi purpose	Single purpose	Single purpose	Single purpose	Single purpose	
Inter-state	Single	Single	Single	Single	
5×120 MW (2×120 MW to be commissioned by the end of third plan).	240 MW	265 MW	54 MW by the end of 1964.	300 MW (6×50 MW each) 2×50 MW in 65-66; 4×50 MW units before the end of 12/66.	
35·35 crores (1960 estimates) 59·32 crores (1964 estimates)	38·28 crores	18·16 crores	4·32 crores	24·91 crores	
Nil	240 MW	Nil	Single unit at 18 MW.	Nil	
100%	100%	Dam completed	100%	Kakki dam-98·7% Kakki flanking dam 77% Pamba 89%.	
Penstocks 100%	Complete	Complete	Complete	Complete	
Civil work-100% Electrical/Mechanical 60% (One unit completed).	Complete	Minor Civil works in progress.	99%	Civil works about 75%.	
..	Jan. 1952	July 1960	..	11/59	
..	..	..	Revised scheme 28-3-59.	Yes [1960-61]	
..	..	..	28-3-59	25-8-60	

Appendix

Sl. No.	Particulars	Sharavathi	Jaldhaka	R. P. Sagar	Uhl
VII	*Finance Clearance*				
	(i) Date of authorisation of Rupee expenditure.	Sanction for Rs. 22·97 crores on 29th June '56/ 2 July 1956.	..	Feb. '61	18-1-1961
	(ii) Foreign exchange sources communicated.	C.E. works-1958 Elec. Stage I-30-6-60 Stage II 16-8-61.	..	5-12-63	from time to time.
	(iii) Date of formal sanction.	Adm. 7/56 Tech. 1-7-61.	..	2/61	30-4-62
VIII	Organisation.				
	(i) Agency for execution date of appointment.	Main dam to Forebay: C.E., Major Grrigation; C.E., S.V.P.C.E., Investigation, Mysore Govt. Forebay to Power House C.E. Hydro Elec. Contruction Project.	Major works were awarded on contract Dy. Chief Engineer (Civil) in Nov. '60.	Chief Engineer, R. P. Sagar.	P. S. E. B. Hydel Orgn.
	(ii) Agency for execution of power station.	Hydro-electric construction project.	Contractor	C.E., R.P. Sagar	C.E. (Project) Irrigation works Punjab.
	(iii) Date of appointment of consultant, if any.	Nil	CW&PC; early '57	29-10-63	No
	(iv) Agency for designs, specn., etc.	C.E., Hydro-construction project.	CW&PC	CW&PC	Hydel Administration Irrigation Dept. Punjab.
IX	*Project Investigations*				
	(i) Selection of dam site Commencement . . .	1952	1957	The investigation started in 1948 & completed in 1962.	..
	Completion. . . .	1954	Middle of 1963	Do.	..
	(ii) Selection of P.S. site Commencement . . .	1952	1957	Do.	6/61
	Completion. . . .	1954	Early 1961 (target)	Do.	8/62
	(iii) Geological survey for dam Commencement. . . .	1953	Nov. 1956	Do.	..
	Completion. . . .	1953	1958	Do.	..

dix 7—*contd.*

Bhakra R.B.	Koyna Stage I	Koyna Stage II	Sholayar	Sabarigiri	Remarks
..	20-2-53	18-7-62	..	4-5-60	
112·5 mil. Rouble credit 21-2-61	IBRD-223 IN dt. 8-4-59 for 897·60 lakhs (incl. some part of second stage) $ 18·70 mil.	IDA 24 IN dt. 8-8-62 for Rs. 833 lakhs ($ 17·5 mil.)	8-2-61	12-7-62	C. E.=Civil Engg.
..	20-2-53	18-7-62	31-1-1960	8-2-61	
C. E. (Con. Punjab S.E.B. G.M. Bakra Dam.	C. E., representing Govt. of Maharashtra in 1954.	..	Kerala SEB for Civil work.	Kerala SEB	
C.E. (Construction) Punjab SEB—G.M., Bhakra Dam.	C.E., representing Govt. of Maharashtra.	Some work executed departmentally while other contract.	C.E.(Elec., construction Division for erection of generating plant.)	KSEB through Contractors.	
Nil	May '59	March '64	Nil	7-9-1962	
Bhakra & Beas Designs organisation, New Delhi M/s. Lengidri Proekt, USSR.	SGPI Geneva	SGPI Geneva	CE (Civil) CE (Elec.)	KSEB for Civil works · for Kakki dam design CW&PC (reviewed) KSEB for all Elec. Plant & equipment.	
..	..	..	T 1956-57 A 1956-57	Investigation completed after one year from July '59.	
..	..	..	T 1957-58 A 1957-58	Do.	
..	..	..	T 1956-57 A 1956-57	Do.	
..	..	..	T 1957-58 A 1957-58	Do.	
..	..	..	T 1956-57 A 1956-57	Do.	
..	..	..	T 1957-58 A 1957-58	Do.	

Sl. No.	Particulars	Sharavathi	Jaldhaka	R.P. Sagar	Uhl
IX. con'd.	(iv) Geological survey for tunnel				
	Commencement . . .	1953	Nov. 1956	The investigation started in 1948 & completed in 1962.	6/61
	Completion . .	1953	..	Do.	6/65
	(v) Site Surveys & Soil Investigation				
	Commencement . . .	1954 Detailed survey 1957.	..	Do.	4/61
	Completion .	1957	..	Do.	9/64
	(vi) Fixation of height of Dam				
	Commencement . . .	1954 Revised 1958	..	The investigations were started in 1948 and completed in 1962.	..
	Completed . . .	..	1957		..
	(vii) Water conductor system				
	Commencement . . .	1954 Revised 1958	1958	Do	6/61
	Completed . . .	..	1958		8/64
	(viii) Land acquisition				
	Commencement . . .	1956, 1957, 1958 & onwards	1958	Do.	1/61
	Completed	1965	1960		6/65
	(ix) Division & De-watering				
	Commencement . . .	1958 (Irrespective of main and subsidiary dam).	..	Do.	..
	Completed	..	In progress		
	(x) Availability of construction materials				
	Commencement . . .	Local areas, Cement, lime, Kankar outside	Was conducted in general way in 1958-59.	Do.	8/61
	Completion . . .	..	..		11/62
	(xi) Access roads & Railway facilities				
	Commencement . . .	Shimogoa and Sirsi.	1958	Do.	1/62
	Completion . . .	..	1960		12/62

dix 7—*contd.*

Bhakra R.B.	Koyna Stage I	Koyna Stage II	Sholayar	Sabarigiri	Remarks
..	..	..	T 1956-57 A 1956-57	Investigation completed after one year from July '59.	
..	..	..	T 1957-58 A 1957-58	Do.	
..	..	..	T 1956-57 A 1956-57	Do.	
..	..	..	T 1957-58 A 1957-58	..	
..	..	..	T 1956-57 A 1956-57	Investigation completed after one year from 7/59.	
..	..	..	T 1957-58 A 1957-58		
..	..	..	T 1956-57 A 1956-57	Do.	
..	..	..	T 1957-58 A 1957-58	Do.	
..	..	..	(a) Within Kerala-land cleared by Forest Deptt. (b) Within Madras—land being completed.	Do.	
..	..	..	(a) Coffer Dam T 2/60 6/60 A 2/60 5/61. (b) Construction slice. T 3/63 A 3/63	Do.	
..	..	..	Yes	Local areas. Steel from HSL & TATA Iron Steel Co. Ltd.	
..	..	..	..	Roads upto work site complete.	
..	..	..	1959-60	Yes.	

Sl. No.	Particulars	Sharavathi	Jaldhaka	R.P. Sagar	Uhl
X.	*Additions and Alterations*				
	(i) Extent of major changes in the scope of the project beyond that cleared by Planning Commission.	Increase in the generation of power from 71,000 kW as approved by P.C. to 89,100 kW.	..	..	(1) Increase in capacity of power flume from 600 CS to 900 CS. (2) Increase in installed capacity from 3 nos. 10 MW each to 3 nos. 15 MW.
	(ii) Major revision in design/ additional works required due to difficulties encountered subsequent to taking up work (*e.g.* geological difficulties, higher flood discharges, material difficulties, construction equipment difficulties etc.).	(i) Change from composite type to masonry type. (ii) Change from forebay to surge tanks. (iii) Water conductor system changed to RCC.	Location of barrage was shifted about 1100 ft. upstream changed to RCC duct open channel.	Revised design envisaged construction of main dam on Chambel river, P.H. on a deep pit at the toe of the main construction ot original design.	Changed from open flume to tunnel; Site of power house changed to right side of Nari Nallah.
		..	..	..	..
		..	..	..	..
	(iii) Extent of revlsion in project estimate as a result of changes.	Original Rs. 22·97 crores (I stage). Revised : Rs. 37·99 crores. Re-revised : Rs. 56·08 crores (I stage).	Present cost : Rs. 970 lakhs	Rs. 623·25	Orlglnal : 472·283 lakhs Revised : Rs. 693·477 lakhs.
	(iv) Time required to obtain sanction of additional expenditure.	2 years from 1958.	..	3 years	PSEB has authorised to incur expenditure.
XI.	*Procurement of Construction Materials.*				P.S. S.Y.
	(i) Steel for structures, etc. Date of Indent . . .	1960	Mostly procured in time.	..	11/62 7/65
	Anticipated date of delivery .	1962	..	7-6-66	5/63 6/67
	Actual date of delivery . .	1963-64		Not yet delivered.	12/63 Expected to on 3/68 7/67
	(ii) Reinforcement steel Date of Indent . . .	1957	Mostly procured in time.	22-11-62	7/62 to 3/66
	Anticipated date of delivery .	1959		15-4-64	..
	Actual date of delivery . .	1958	..	3/64	Partly recd.
	(iii) Cement Date of Indent . . .	1957 onwards	Shortage on various occasions during construction.	These were procured as and when required.	4/61 12/67 Received 21400 M/T Balance 15100 M/T.
	Anticipated date of delivery .				
	Actual date of delivery . .	..	..	..	

dix 7—*contd.*

Bhakra R.B.	Koyna Stage I	Koyna Stage II	Sholayar	Sabarigiri	Remarks
Nil	(1) For the dam work, a shear zone was noticed crossing the foundation of three monoliths blocks, which was excavated down to good rock and filled back with concrete. Also in the gorge portion, on account of a small depth of good rock, a trench of 60 ft. was taken to the next layer of good rock. (2) Layout of collection gallery was modified after hydraulic model studies.		No	Height of dam was raised by 10′ to increase in reservoir. The power draft after diversion of adjacent catchments will increase to 966 cusecs from 830 cusecs.	
Nil	..	..	Revised—Over 6·5 crores.	Original (pro.) 24·91 crores Revised : 36·4 crores.	
Nil	..	..	..	Not yet sanctioned.	
No delay	No hold up	..	..	M.S. and H.S. steel from USA for penstock and Indian steel for other items.	P.S.=Penstock. S.Y.=Swtichyard.
..	..				
No delay	..	No hold up	No difficulty was experienced in processing.	From the bulk supply.	
Do.	..	..	Allocation was short of demand.	From the factory thro. Regional Controller.	

Sl. No.	Particulars	Sharavathi	Jaldhaka	R.P. Sagar	Uhl
XI. contd.	(iv) Other critical materials . .	Blasting material and TCT drill rods was restricted for sometime.	..	..	These are being arranged according to needs.
XII.	*Procurement of Equipment for Construction*				
	(i) Construction machinery .	1959	Mostly arranged in time.	..	..
	(ii) Conveying equipment belts, etc.	..	Not required	..	..
	Date of Indent . . .				2/63
	Anticipated date of delivery .				12/64
	Actual date of delivery . .				12/65
	(iii) Chilling Plant . . .	..	Not required	..	..
	(iv) Generating plant and auxiliaries.	..	Mostly arranged in time.	22-4-62 30-5-65 19-3-64	..
	(v) Mechanical equipment, gates, etc.	..	Do.	22-11-62 23-10-63 4/64	..
	(vi) Water control system . .	..	..	22-11-62 30-4-65 5/64	Already existing at Barot.
	(vii) P.H. crane, Gantry etc.	..	Arranged in time	22-11-62	1/65
	(1)	..		11/63	3/66
	(2)	..		20-4-64	3/66
	(3)				
	(viii) P.S. Switchgear & Controls	..	Mostly arranged in time	22-11-62	..
	(1)	..		1-11-64	..
	(2)	..		10/64	..
	(3)				
	(ix) Step up station equipment	..			
	(1)	..	Do.	22-11-62	..
	(2)	..		1-4-65	..
	(3)			20-4-64	..
	(x) Other electrical equipment incl. power and control cables.	..	Do.	13-4-66	..
	(1)	..		13-9-66	..
	(2)	..		Not yet delivered	..
	(3)				
	(xi) Construction power plant (if any).	(1) Gates (Sub. Dam)-60 Gates (Main). 60 Water Conductor sym. 60)	Arranged in time	..	..
		(2) Gates (Sub. Dam)-62 Gates (Main)-62. Water Conductor sym. 62	..	..	..
		(3) Gates (Sub. Dam)-63 Gates (Main) 63 & 64 Water conductor sym. 63.	..	..	..

dix 7—*contd.*

Bhakra R.B.	Koyna Stage I	Koyna Stage II	Sholayar	Sabarigiri	Remarks
No delay	..	..	..	..	
Already presented.	..	..	F.E. sanction and opening letter of credit after placing orders.	..	
Already exist	..	..	Do.	..	
..	..	..	Do.	..	
..	..	..	Do.	..	
..	..	..	Do.	..	
..	..	..	Do.	..	
..	..	..	Do.	..	(1) Date of Indent
..	..	..		..	(2) Anticipated date of delivery
..	..	..		..	(3) Actual date of delivery
..	..	..	Do.	..	
..	..	..		..	
..	..	..		..	
..	..	..	Do.	..	
..	..	..		..	
..	..	..		..	
..	..	..	Do.	..	
..	..	..		..	
..	..	..		..	
..	Diesel sets 2 from Baroda were commissioned in 3/56. 3 more in 1/57-2/57. 2 more in 2/58	..	Do.	..	
..	..	..	Do.	..	
..	..	..	Do.	..	

Sl. No.	Particulars	Sharavathi	Jaldhaka	R.P. Sagar	Uhl
XIII.	*Landing & Clearing*				
	(i) Agency for landing clearing through customs and despatch to site.	(1) Best & Co. Madras (2) S.I. Corp. Madras (3) Nav Bharath Corp. Bombay (4) Gopal & Kumar, Calcutta	Engaged clearing agents & transport contractors.	Asst. Director Shipping, DGS&D, Bombay	Director of Shipping Bombay.
	(ii) Shortest & longest time required to clear major consignments.	Six days/Nine months	..	2 months/one year	..
	(iii) Agency for checking stores at site & settling claim.	(1) Chief Engineer, HCP (2) Executive Engineer, SVP	Departmentally	Departmental field staff	S.E. Hydel Uhl Construction circle E.E. Hydel Mech. Division
	(iv) Shortest & longest time required to obtain F.E. release	3 months/3-12 months	..	Not applicable	6 months/12 months
XIV.	*Civil Works (Access road)*				
	Commencement	1958	..	Completed in I stage	1/64
	Completion	1963	..	..	completed
	(ii) Colony & staff quarter (Comm.)	1958	1960	1961	10/61
	(Comple) . .	1963	1963	1966	12/67
	(iii) Railway siding (Commence) .	..	..	Not required	..
	(Comple) . .	..	..	..	..
	(iv) Diversion Tunnel . . .	..	..	Do.	..
	(v) Coffer Dam	..	As required during construction	Executed by department	..
	(vi) Levelling	..	..	Do.	..
	(vii) Site stores	..	Between 1959 & 62	1961-65	7/61, 3/66
	(viii) Concrete work for construction of P.S.	..	..	..	Departmental
	Date of invitation of tender .	60	1961	6/65	
	Date of award of contract .	1/61 ..	1961 ..	10-8-65	Departmental 1/65
	Date of commencement .	3/61 ..	1962 ..	16-10-65 ..	12/65 .. Completed
	Date of completion . .	2/63 ..	1966 ..	In progress	Completed

dix 7—*contd.*

Bhakra R.B.	Koyna Stage I	Koyna Stage II	Sholayar	Sabarigiri	Remarks
DGS&D (Asst. Director, Shipping Bombay, and Calcutta)	(a) Scindia & Co. Bombay (b) Kariji Jadharji & Co. (c) V. D. Swamy Bombay	(a) Navabarath Corp. Bombay (b) Anbalal Muljibhai, Bombay. (c) Shanker & Co. (d) Kaniji Jodharji & Co. Bombay	DGS&D for clearance at port. KSEB for despatch to site.	..	
15 days/2·3 months for 130 ton transformer to paucity of special transformers.	7 days/2 months	..	..	..	
Departmental (PSEB)	Departmentally	Departmentally	..	Departmentally	
..	3 weeks/14 months	..	..	6 months	
Already Existing	..	..	1956-57	..	
..	..	..	1959-60	..	
Do.	...	...	1957-58	..	
..	..	..	1958-59	..	
Completed before the material started arriving by rail	..	...	..	..	
Already existing	..	..	..	..	
Do.	....	..	Commencement (1) T2/60 A-2/60 (2) T10/60 A11/60 Completion (1) Not completed (2) T11/60 A5/61	..	
Do.	..	..	..	..	
Do.	..	..	..	..	
	...	..	..	..	
	..				
	..				
..	..	..	..	..	
..	4/57	..	2/62	..	
..	..	..	9/62	..	
..	..	..	..	..	
..	..	..	9/62	..	
..	..	..	..	..	
..	..	..	9/64	..	
..	..	..	..	..	

Appen-

Sl. No.	Particulars	Sharavathi	Jaldhaka	R.P. Sagar	Uhl
XIV. (contd.)	(ix) Excavation works in dam site .				
	Date of invitation of tender .	..	Departmentally	..	..
	Date of award of contract .	..	..	..	..
	Date of commencement .	..	1963	15-1-61	..
	Date of completion . .	..	..	..	..
		..	1963	15-1-61	..
		..	In progress	..	..
		..	..	1965	..
	(x) Concrete works in p.s. building				
	Date of invitation of tender .	..	..	..	Departmental
		..	1961	6/65	
	Date of award of contract .	..	..	..	Departmental
		..	1961	10-8-65	
	Date of commencement .	..	..	..	1/65
		..	1962	16-10-65	..
	Date of completion . .	..	..	15-1-67	12/65
		..	1966	In progress	6/67
	(xi) Concrete works for T.G. foundations				
	Date of invitation of tender .	Departmental	..	..	Departmental
	Date of award of contract .	..	..	6/65	
		..	..	..	Departmental
	Date of commencement .	..	..	10-8-65	12/65
	Date of completion . .	3/61	..	..	3/67
		..	..	16-10-65	Complete
		2/63	..	15-1-67	2/67
			..	In progress	
	(xii) Fabrication of structures				
	Date of invitation of tender .	..	..	..	Departmental
	Date of award of contract .	..	..	6/65	
		..	..	..	..
	Date of commencement .	..	..	10-8-65	
	Date of completion . .	..	..	..	..
		..	..	16-10-65	..
		..	..	15-1-67	..
		..	..	In progress	..
	(xiii) Erection of super-structures				
	Date of invitation of tender .	..	..	..	Departmental
	Date of award of contract .	..	..	6/65	..
		..	..	..	..
	Date of commencement .	..	..	10-8-65	..
	Date of completion . .	..	..	..	..
		..	..	16-10-65	..
		..	..	15-1-67 ..	..
		..	..	In progress	..
	(xiv) Construction of channel, surge tanks etc.				
	Date of invitation of tender .	Early '60	..	..	Departmental
		..	1960	8/62	..
	Date of award of contract .	..	..	..	..
		11/60	1960	23-3-63	..
	Date of commencement .	..	..	..	..
		11/60	1960	7-10-63	10/62
	Date of completion . .	..	..	20-1-67	3/66
		Early '64	1966	In progress	6/67
	(xv) Water conductor system				
	Date of invitation of tender .	..	..	..	Departmental
		..	1960	6/65	..
	Date of award of contract .	..	..	..	..
		..	1960	10-8-65	
	Date of commencement .	..	..	..	..
		..	1960	16-10-65	10/62
	Date of completion . .	..	..	15-1-67	3/66
		..	1966	In progress	6/67

dix 7—*contd.*

Bhakra R.B.	Koyna Stage I	Koyna Stage II	Sholayur	Sabarigiri	Remarks
Already completed	..	..	..	..	
..	..	..	..	..	
..	..	..	..	..	
..	..	..	..	..	
..	..	..	..	..	
..	..	..	..	..	
..	..	..	..	..	
Unit 6 (I stage) Com. 2-1-63 Comp. 31-7-64 Unit 7 Com. 28-12-62 Comp. 7-10-64 Unit 6 (II stage) Com. 7-3-65 Comp. 5-9-65 Unit 7 (II stage) Com. 27-8-65 Comp. 6-12-65	..	..	..	..	
Do.	..	..	..	..	
Do.	..	..	..	..	
Do.	..	..	..	..	
Do.	..	..	..	..	
Do.	..	..	..	..	
Do.	..	..	..	..	
Do.	..	..	..	..	
Civil parts completed in time	..	..	..	..	
Do.	..	..	..	..	
Do.	..	..	..	..	
Do.	..	..	..	..	
..	..	..	..	..	
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..	..	..	..	..	

Sl. No.	Particulars	Sharavathi	Jaldhaka	R.P. Sagar	Uhl
XV.	*Date of Starting & completion each major part of Project work*				
	(i) Dam				
	Date of commencement	I stage II stage 58 63	63	5-12-61	..
	Date of completion	'64 Contn.	Nearing completion	In progress	..
	(ii) Tunnel				
	Date of commencement	1960	1961	7-10-63	1/62
	Date of completion	63-64	1966	In progress	6/67
	(iii) Channels				
	Date of commencement	1959	1962	..	1/62
	Date of completion	1964	1966	..	6/67
	(iv) Surge tank				
	Date of commencement	11/60	1962	1/64	..
	Date of completion	Early 1964	1965	In progress	..
	(v) P.H. Crane				
	Date of commencement	6/63	1964	9/65	1/67
	Date of completion	12/63	1964	In progress	2/67
	(vi) Turbo-generator	I II			
	Date of commencement	5/63 2/63	1964	12/65	4-5-67
	Date of completion	12/64 5/65	Nearing completion	In progress	5/69
	(vii) Switchyard	Stage I Stage II			
	Date of commencement	9/63 1/65	65	..	6/67
	Date of completion	12/64 5/65	66	..	12/67
XVI.	*Commissioning*				
	(i) Procurement of oils, lubricants, consumable and other stores :				
	Date of Indent	Procured in small consignments every year as per requirement.	..	1-7-66	This is a continued progress starting from 1/61 and ending till 1969.
	Anticipated date of delivery	..	..	1-8-66	..
	Actual date of delivery	..	..	Not yet delivered.	..
	(ii) Precommissioning test				
	Date of commencement				Unit
	Target	..	12/66	Not yet	1 8/66
		Unit			2 12/66
	Actual	1 12/64	..	..	3 3/67
		2 3/65			1 4/68 (Revised)
					2 12/68
					3 4/69
	Date of completion—Target	..	..	..	Unit
		Unit			1 9/66
	Actual	1 1/65	..	..	2 1/67
		2 4/65			3 4/67
					1 5/68
					2 1/69
					3 5/69

dix 7—*contd.*

Bhakra R.B.	Koyna Stage I	Koyna Stage II	Sholayar	Sabarigiri	Remarks
Already completed	11/54 6/64	Completed ..	.. ..	*Pamba 20-11-61 *Kaki 1-11-61 *Flanking 4-11-63	*Date of starting.
Already completed	11/56 1/62	.. ..	.. ..	.. ..	
Not involved in the design of PP II.	10/57 6/62	.. ..	.. ..	.. ..	
Do.	3/56 2/63	.. ..	.. ..	.. ..	
I II 12/64 1/65 2/65 5/65	9/59 Completed 5/60	.. ..	5/64 3/65	.. ..	
I-end of '64 II Beg. of '65	I II III 2/60 5/60 6/60 IV 2/61	V VI VII* 3/65 11/64 4/62	7/65		*VIII-3/64
I II 3/66 9/66	I II III 7/61 11/61 4/62 IV-10/62	V VI VII* In pro- 10/66 7/64 gress	Not yet completed		*VIII-3/66
7/64	10/60	1/65	7/65	..	
3/66	5/62	In progress	7/66	..	
Oil & Grease —4/65 Transformer oil —6/65	Obtained along with the main equipment and did not present any difficulty in commissioning.		29-2-64	..	
8/65	Do.		5/64	..	
Oil & Grease —4/66 Transformer oil —2/66	Do.		4/64	..	
Unit 1 1/66 1 4/66	..	..	Unit 1 1/64 2 2/64 3 3/64 1 4/66 2 Not yet started 3 Do.	Unit 1 7/63 2 7/63 3 7/63 4 11/63 5 11/63 6 11/63 1 4/64 2 4/64 3 4/64	
2/66 5/66	Unit 1 10/60 2 9/62 3 10/61 4 4/62 1 5/62 2 9/62 3 1/63 4 2/63	Unit 5 3/67 6 9/66 7 3/66 8 9/65 5 Not com. 6 11/66 7 6/66 8 4/66	Unit 1 1/64 2 2/64 3 3/64 1 5/66 2 Not completed 3 Do.	Unit 1 6/65 2 8/65 3 10/65 4 12/65 1 18-4-66 2 14-6-66 3 29-12-66	

Sl. No.	Particulars	Sharavathi	Jaldhaka	R.P. Sagar	Uhl
XVII	*Periods of Holdups—Due to*				
	(i) Additional investigation .	..	One season due to change of barrage site.	..	..
	(ii) Non-availability of spares .	..	10/12 weeks	..	About 12 months.
	(iii) Non-availability of skilled personnel.	..	..	..	..
	(iv) Delay in deciding the site .	..	One season	..	Does not arise
	(v) Lack of inter-state agreement	..	Nil	..	2 years (land acquisition).
	(vi) Delay in Construction Drgs.	..	..	..	..
	(vii) Change of foundation . .	..	Investigation work was inadequate and a delay of 104 weeks.	Unsatisfactory foundation in certain length of main dam.	..
	(viii) Change in scope . . .	..	Do.	..	—
	(ix) Scope of work sanctioned .	..	Nil	..	..
	(x) Shipment . . .	..	..	..	Unit 1 69 weeks 2 91 weeks 3 87 weeks due to delivery equipment by HE(I) Ltd.
	(xi) Landing & clearing . .	..	..	..	About 6 months
	(xii) Receipt of construction equipment.	..	At the initial stage 10/12 weeks delay.	..	Do.
	(xiii) Procedural delay . . .	..	Few weeks	..	About 12 months.
	(xiv) Labour strikes, etc. . .	..	24 weeks due to flood disaster.	..	..
	(xv) Co-ordination . . .	..	..	..	About 1½ year supply of generating sets by HE(I) Ltd.
	(xvi) De-watering problem . .	..	..	..	..
	(xvii) Non-availability of contractor for tunnel work.	..	..	..	..
	(xviii) Want of time for tunnel .	..	..	..	..
	(xix) Want of workshop for fabrication, etc.	..	..	..	..
	(xx) Receipt erection equipment .	..	..	..	6-8 months

dix 7—*contd.*

Bhakra R.B.	Koyna Stage I	Koyna Stage II	Sholayar	Sabarigiri	Remarks
Nil	..	..	No delay	..	
Does not relate	..	..	Do.	..	
Nil	..	..	Do.	..	
Does not relate	..	..	Do.	..	
Nil	..	..	P.C. was not approved until the dispute between Madras & Kerala, reg. using of water were settled.	..	
Nil	..	..	..	..	
Nil	..	..	..	..	
Nil	..	..	..	..	
Nil	..	..	..	..	
Nil	..	..	Yes	..	
Nil ..	..	..	No delay	..	
..	..	..	Do.	..	
No special hold up.	..	..	Do.	..	
Nil	..	..	Do.	..	
Nil	..	..	Do.	..	
..	..	..	Do.	..	
Work done departmentally.	..	..	Do.	..	
..	..	..	Do.	..	
Nil	..	..	Do.	..	
Nil	..	..	Considerable delay by manufacturers of T.G.	..	

Appen-

Sl. No.	Particulars	Sharavathi	Jaldhaka	R.P. Sagar	Uhl
XVII Contd.	(xxi) Legal proceedings, etc. . .	..	..	..	About 12 months dispute with Kiln-contractors.
	(xxii) Other reasons . . .	The stage I f civil wo s was programmed to be completed by 12/62. But due to certain technical difficulties like labour strikes in 12/59. Ultimately heavy rains in '61; delay in importing certain equpt. The target date was postponed to '64 & stage I was completed in 12/64 only.	..	Delay in procurement of (i) steel plates for crest gates; (ii) parts for grouting machinery; (iii) in erection of sluice gates due to release of FE, transport difficulties & in inspection by DGS&D; (iv) in the construction of tail race tunnel due to unsatisfactory type of detonators.	Release of FE for Switch gear equipment 52 weeks.
XVIII	*Construction Schedule and Fund Allotment*				
	(i) Target construction schedule and revision thereof. This may be shown in a bar chart listing major items.	..	3 years/work nearing completion (started in '60).	..	..
	(ii) Fund required to meet the target construction schedule year to year (in Rs. lakhs)				
	1961-62			..	37·36
	62-63			..	146·81
	63-64			60	109·82
	64-65			110·98	169·98
	65-66			202·50	190·38
	(iii) Fund allotted yearwise (in Rs. lakhs)				
	1961-62	*982·00		187·4	37·36
	1962-63	1884·25		275·65	99·54
	1963-64	1569·50		340·00	90·03
	1964-65	1495·50		345·62	96·23
	1965-66	1085·00		403·25	104·61
	(iv) Actual expenditure yearwise (in Rs. lakhs)				
	1961-62	935·29	61·84	70·25	27·00
	1962-63	1209·45	82·56	169·98	78·08
	1963-64	1257·23	186·60	298·23	81·42
	1964-65	877·76	189·35	524·84	90·56
	1965-66	1085·00(a)	204·80	621·06	128·76
	1966-67				
	1967-68				
	Before III Plan				

dix 7—*contd.*

Bhakra R.B.	Koyna Stage I	Koyna Stage II	Sholayar	Sabarigiri	Remarks
Nil	..	..	..	..	
Due to-(a) difficulties in the matching of penstocks with scrollcasing 2 weeks for the I unit (b) delay in fabrication of structures, civil works in switchyard, late arrival of Soviet Specialist (c) shortage of water in the pond due to less rainfall 8 weeks (d) in completion of 2 stage concreting was due delay in releasing the unit for stage II concreting by PSEB as a result of target time taken by them in assembling, welding, etc.	Due to (a) leakage in 220 KV oil filled cables (b); receipt of release of necessary FE took considerable time; (c) receipt of import licence took considerable time; (d) stage II was originally planned on repeat order basis, however, retendering took 12 months.				
Target date Unit 1 End of Jan. '66 Unit 2 End of 4/66	..	..	..	..	
63·08	512·28				*Electrical work.
147·00	662·50				
200·91	345·06				
669·94	422·19				
724·00	626·73				
48·82*	536·90		74·18	182·99	*Audited figure.
122·02*	571·65		73·82	289·07	
350·00†	371·49		159·72	457·06	†Departmental figure.
590·06†	440·43		174·94	707·49	
783·75†	366·91		84·30	1191·14	@Estimate.
			35·00	586·00	
			25·00	166·00	
			100·80	171·68	

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PROCUREMENT SCHEDULE FOR

Hydro Electric

Sharavathi Valley Hydro Electric Project

AID LOAN

Major Equipment Procurement Status

Sl. No.	Description	Supplier or Firm	Ordered	
			Scheduled	Actual
1	Hydraulic turbine	M/s. Neyrpic, France (M/s. Batli Bai & Co.).	..	March 1960
2	Generators & accessories butterfly valve.	M/s. Hitachi, Japan (M/s. William Jacks, Madras).	..	March 1960
3	Transformers	M/s. English Electric Co., (U.K.) of Madras.	..	April 1960
4	E.O.T. crane	M/s. Hitachi, Japan	..	June 1961
5	Air valves	M/s. Glenfield & Kennedy, Calcutta	..	June 1961
6	10 ton jib crane	M/s. Indmag Pvt. Ltd., Bombay	..	June 1961
7	15 ton jib crane	M/s. B. H. Hari & Co., (P) Ltd., Delhi.	..	June 1961
8	Potential transformers . . .	M/s. Dodsal Pvt. Ltd., Bombay	..	Dec. 1961
9	Lightning arrestors . . .	M/s. ASEA Electric Pvt. Ltd., Madras	..	July 1961
10	Circuit breakers	M/s. Voltas Ltd., Bombay	..	July 1961
11	Disconnecting switches . . .	M/s. Batli Boi & Co., Bombay	..	Dec. 1961
12	Control panels	M/s. I.G.E. New York of India	..	Dec. 1961
13	M. G. sets	M/s. G.E.C. New York of India	..	Dec. 1961
14	D.C. panels	M/s. Larsen & Toubro Ltd., Madras	..	Feb. 1962
15	Trolly Hoist	M/s. Western Works Manufacturing Co. Bombay.	..	May 1950
16	400 volts switchgear . . .	M/s. Dodsel Pvt. Ltd., Bombay	..	Dec. 1961
17	Oil filtering set	M/s. Binny & Co., U.K.	..	June 1962
18	Oil testing transformers . .	M/s. B.I.C.C. Co., Madras	..	June 1962
19	Bus support insulators . . .	M/s. Associated Engg. Services, Bangalore.	..	June 1962
20	Synchronous condenser . .	M/s. A.E.G., West Germany	..	June 1962
21	Flexible joints	M/s. Indian Hume Pipe Co., Bombay	..	Apr. 1962
22	H.T.S. plates	M/s. Bengal Corpn. Ltd., Calcutta	..	June 1962
23	2 Nos. of 50 ton crane . . .	M/s. Indocen Ltd., Delhi	..	July 1962
24	Power cables	M/s. A.C.E.C. India Pvt. Ltd., Madras-1	..	Aug. 1962
25	Drainage equipment . . .	M/s. Stewarts & Lloyds of India (P). Ltd., Calcutta.	..	Aug. 1962
26	20 ton tractor	M/s. Ashok Leyland Ltd., Madras	..	Oct. 1962
27	One worm-geared chain pulley block	M/s. Greeves Cotton & Co., Madras	..	Oct. 1962

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HYDRO POWER STATIONS

Construction Projects

(2 units of 89, 100 kW Each)

120.

as on 30-6-1966

Delivered at site		Cost in U.S. Dollars in thousands			Remarks
Scheduled	Actual	D.L.F.	Others	Total	
..	Dec. 1963	962·22	..	962·22	
..	June 1963 June 1962	1402·17	..	1402·17	
..	June 1962	1090·32	..	1090·32	
..	Dec. 1962	197·40	..	197·40	
..	May 1962	10·92	..	10·92	
..	Oct. 1962	35·70	..	35·70	
..	Nov. 1962	72·30	..	72·30	
..	Sept. 1963	56·70	..	56·70	
..	July 1963	34·86	..	34·86	
..	July 1963	504·00	..	504·00	
..	April 1963	170·94	..	170·94	
..	April 1963	509·67	..	509·67	
..	Aug. 1963	12·60	..	12·60	
..	Nov. 1963	30·03	..	30·03	
..	June 1962	8·61	..	8·61	
..	Nov. 1963	141·75	..	141·75	
..	Jan. 1964	41·79	..	41·79	
..	Mar. 1964	28·77	..	28·77	
..	May 1963	42·63	..	42·63	
..	Mar. 1965	223·44	..	223·44	
..	Mar. 1965	45·99	..	45·99	
..	July 1964	31·08	..	31·08	
..	July 1963	72·53	..	72·53	
..	Dec. 1964	59·64	..	59·64	
..	Oct. 1963	7·35	..	7·35	
..	July 1963	6·72	..	6·72	
..	July 1963	0·76	..	0·76	

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Sl. No.	Description	Supplier or Firm	Ordered	
			Scheduled	Actual
28	Pulley block	M/s. Greeves Cotton & Co., Madras	..	Oct. 1962
29	Spirit level	M/s. Schneider & Kern, West Germany.	..	Feb. 1963
30	Chequered plates	M/s. Herman & Mohta Pvt. Ltd., Calcutta.	..	Feb. 1963
31	P.L.C. equipment	M/s. Nippan Electric Co., Japan	..	Dec. 1965
32	150/30 ton crane for Bangalore Sharavathy Receiving Station.	M/s. Indocean Ltd., New Delhi	..	June 1962
33	M.S. plates	..	..	March 1963

dix 7A—*contd.*

Delivered at site		Cost in U.S. Dollars in thousands			Remarks
Scheduled	Actual	D.L.F.	Others	Total	
..	Dec. 1964	2·21	..	2·21	
..	Apr. 1965	0·21	..	0·21	
..	Feb. 1964	11·42	..	11·42	
..	Not arrived	51·03	..	51·03	
..	Dec. 1964	103·00	..	103·00	
..	Dec. 1964	45·99	..	45·99	

Chief Engineer
H. E. C. P.

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HYDRO ELECTRIC

Sharavathi Valley Hydro Electric Project

AID (D.L.F.)

Major Equipment Procurement Status

Sl. No.	Description	Supplier	Ordered	
			Scheduled	Actual
1	4031 Power transformers . . .	I.G.E., New York	..	Jan. 63
2	4021 Generators	I.G.E., New York	..	Dec. 62
3	4044 Switchgear	Westinghouse, New York	..	Jan. 64
4	4042 Potential transformers . .	Allis Chalmers, U.S.A.	..	June 64
5	4055 Control panels	I.G.E., New York	..	March 65
6	4047 D.C. panels	Westinghouse, New York	..	Aug. 64
7	4073 Power cables	General Cable Corporation, New York	..	Feb. 64
8	4063 Synchronous condensers .	I.G.E., New York	..	Nov. 64
9	4001 Steel for penstocks . .	Luria Steel and Trading Corporation, U.S.A.	..	June 63
10	4050 150 ton crane for Hubli . .	Harnis Ch. feger Corpn., U.S.A.	..	July 64
11	.. 1470 ton aluminium rods and 982 ton steel rods, 700 ton high carbon steel rods.	Renaults Co., U.S.A.	..	Apr. 64
12	4003 Air valves Foreign Exchange .	Valve and Primer Corporation, U.S.A.	..	Mar. 65
13	.. Released for I.H.P. Co. . .	..	..	Not known

dix 7A—*contd.*

CONSTRUCTION PROJECTS
(6 *Units* 89, 100 kW *each*)
LOAN 197
as on 30-6-1966.

Delivered at site		Cost in U.S. Dollars equipment			Remarks
Scheduled	Actual	D.L.F. (F.A.S.)	Others	Total	
..	Sept. 64	22,17,917·00	..	22,17,917·00	
..	May 65	38,94,960·00	..	38,94,960·00	
..	Oct. 65	17,24,893·00	..	17,24,893·00	
..	Sept. 65	94,919·00	..	94,919·00	
..	..	3,68,625·00	..	3,68,625·00	
..	Sept. 65	27,256·00	..	27,256·00	
..	May 65	1,76,332·00	..	1,76,332·00	
..	..	8,72,257·00	..	8,72,257·00	
..	Jan. 66	22,88,497·00	..	22,88,497·00	
..	Dec. 65	1,03,887·00	..	1,03,887·00	
..	..	15,11,144·00	..	15,11,144·00	
..	Dec. 65	42,848·00	..	42,848·00	
..	..	5,04,000·00	..	5,04,000·00	

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K. H. E. P. PROCUREMENT
ANNEXURE

Name of Equipment	Preparation of Specifications		Fixation of
	Target	Actual	Target
Stage I			
1. Turbine (First unit)	10/55-4/56	10/55-2/56	4/56-10/56
2. Generator (First unit)	10/55-4/56	10/55-3/56	4/56-9/56
3. Transformer (First unit)	12/55-5/56	12/55-3/56	5/56-10/56
4. Indoor Switch-gear (First unit)	12/57-5/58	12/57-5/58	6/58-8/58
5. 220 kV Cables (First unit)	6/58-11/58	6/58-3/59	11/58-5/59
6. P.H.T. Switch-gear	1/57-5/57	1/57-5/57	5/57-7/57
7. Emergency Valve (First unit)	9/57-1/58	9/57-2/58	2/58-6/58
8. Petty Crane	2/56-5/56	3/56-5/56	5/56-8/56
9. Power House Crane	10/56-12/56	10/56-12/56	12/56-4/57
Stage II			
1. Emergency Valves (First set)	5/63-10/63	5/63-10/63	11/63-4/64
2. Turbine (First set)	1/62-6/62	1/62-6/62	6/62-8/62
3. Generator (First set)	1/62-6/62	1/62-6/62	6/62-8/62
4. Transformer (First set)	3/63-8/63	3/63-8/63	8/63-1/64
5. 220 kV Cables (First set)	8/63-11/63	8/63-11/63	11/63-7/64
6. Outdoor Switch-gear	2/63-5/63	2/63-5/63	6/63-9/63
7. Indoor Switch-gear	2/63-8/63	2/63-8/63	9/63-9/63

dix 7A—*contd.*

OF EQUIPMENT
A

Tender	Manufacture		Delivery	
Actual	Target	Actual	Target	Actual
3/56-10/56	10/56-9/58	10/56-9/58	10/58-4/59	10/58-2/60
4/56-9/56	9/56-7/59	9/56-4/60	7/59-12/59	5/60-9/60
4/56-10/56	10/56-7/59	10/56-10/60	8/59-2/60	11/60-5/61
6/58-9/58	9/58-10/59	10/58-12/60	11/59-1/60	1/61-7/61
3/59-2/60	6/59-1/60	3/60-7/60	2/60-4/60	8/60-10/61
5/57-8/57	8/57-7/59	8/57-7/60	8/59-12/59	8/60-12/60
3/58-6/58	6/58-10/59	6/58-6/60	10/59-5/60	7/60-9/61
6/56-8/56	9/56-11/57	9/56-11/57	12/57-10/58	12/57-3/58
1/57-8/58	5/57-9/58	9/58-6/59	9/58-3/59	7/59-8/59
11/63-3/64	14/64-3/65	4/64-9/65	4/65-6/65	10/65-11/65
6/62-8/62	8/62-12/63	8/62-12/63	12/63-3/64	12/63-3/64
6/62-8/62	8/62-8/64	8/62-8/64	9/64-12/64	9/64-12/64
8/63-1/64	1/64-12/64	1/64-12/64	12/64-2/65	12/64-5/65
11/63-7/64	7/64-11/64	7/64-11/64	12/64-2/65	12/64-3/65
6/63-9/63	10/63-8/64	10/63-8/64	9/64-3/65	9/64-3/65
9/63-9/63	10/63-8/64	10/63-8/64	9/64-12/64	9/64-12/64

Appendix

UHL RIVER

Sl. No.	Particulars	Date	Preparation of specification by Consultants	Approval of specification by project authority	Issue of tender specification & the issuing authority	Terminal date for receipt of tender	Finalisation and recommendation of tender
1	2	3	4	5	6	7	8
10·4	Generating Unit and accessories.	Target Actual	Generating Unit being procured through M/S HEIL, Bhopal, Technical particulars received from the firm approved by Hydel Designs Directorate from time to time.				
10·8	Power Station Switchgear and Control.	Target Actual	Specification prepared by DHD.	..	12/65 (Revised 9/67) Specification for most of equipment finalised in time.	From time to time.	
10·9	Step-up Station Equipment	(i) Power Transformer. Target Actual	Technical particulars received from HEIL, Bhopal, approved by Hydel Designs Directorate.				
		(ii) 132 kV Switchgear etc. Target Actual	12/64 9/64		12/64 10/64	1/65	6/65 6/65
10·10	Other Electrical Equipment including Power Control cables.	Target	6/56				2/66 (M/S Oriental Power Cables)
		Actual	7/65			9/65	2/66 (M/S U/G & PVC Cables of India.)
10·11	Haulageway Equipment .		3/62		5/62	8/62 due date	
10·12	5/20 Ton Crane . .	Specification prepared by Hydel Designs Directorate not by consultants.	3/63		3/63	5/63	(i) 7/63 (ii) 7/64
10·13	Hydraulic Hoist . .		5/65		5/65	8/65	(i) 11/65 (ii) 12/65
10·14	High Pressure sprinkler Fire Extinguishing system.		8/65		9/65	5/66	5/66

7A—*contd.*

PROJECT—STAGE II

Issue of letter of intent	Submission of application for import licence	Release of foreign exchange by Ministry of Finance	Issue of import licence	Opening of letter of credit if required	Manufacture and delivery of equipment			Remarks
9	10	11	12	13	14			15
11/63	Being arranged by M/S HEIL			Not required	Item	Target	Actual	
					1st Turbine	9/65	Despatch expected Ex. U.K. in 1/67	
					1st Generator	8/65		
					2nd Turbine	3/66	Revised by HEIL to 1/67	
					2nd Gen.	2/66	Do. 11/67	
					3rd Tur.	7/66	Do. 7/67	
					3rd Gen.	6/66	Do. 2/68	
4/64					3 Nos.	9/66		
					3 Nos.	9/66		
					3 Nos.	10/66		
					4 Nos.	11/66		
9/65		10/66	Still awaited			9/66		12 months Ex. Works after receipt by the firms of import licence.
..	..	..	..	..		6/66		Specification for control cable was sanctioned in 10/66. Tender notice published in 11/66 & tenders are due by 5-1-67.
2/63	1/63	5/63	11/64	..				
3/64	1/65	1/65	1/65	..				
12/65	12/65	Foreign exchange has not been received so far.						
8/66	Not applicable	..	..	..	To match with the erection of step-up transformer.			Detailed purchase order under issue.

Appendix

UHL RIVER

Sl. No.	Particulars	Date	Preparation of specification by consultants	Approval of specification by project authority	Issue of tender specification & the issuing authority	Terminal date for receipt of tender	Finalisation and recommendation of tender
1	2	3	4	5	6	7	8
1	2 Nos. Universal Excavators Skoda By-I.	..	..	..	9/61 D.H.D. Chandigarh	10/61	11/61 Hydel S.P.C. (U)
2	2 Nos. Caterpillar D-7 Series E Tractor.	..	..	..	9/61	10/61	11/61
3	2 Nos. coles Model Dominent fixed Electric crane.	..	..	..	Do.	Do.	Do.
4	8 Nos. Mogurt Model DR 50 D Hungarian Make Rear and Diesel Dumper.	..	..	..	Do.	Do.	Do.
5	4 Nos. Pump crete concrete pump type PC-3.	..	..	..	4/63 Do.	5/63	6/63
6	1 No. Scammell Highwaymen 4×2 Truck Tractor.	..	..	..	6/62 Do.	7/62	10/62
7	1 No. 50/10 Ton Electric over head crane.	..	..	..	1/63 Do.	4/63	10/64 Hydel Committee

7A—*contd*

PROJECT—STAGE II

Issue of letter of intent	Submission of application for import licence	Release of foreign exchange by Ministry of Finance	Issue of import licence	Opening of letter of credit if required	Manufacture and delivery of equipment	Remarks
9	10	11	12	13	14	15
12/61	..	..	..	..	(1) 1961 Model Czechoslovakia (2) 1 No. in 7/62 1 No. in 9/62	
12/61	..	5/62	5/62	..	(1) USA Make (2) 1 No. in 8-9-62 1 No. in 9/62	
12/61	12/61	4/62	5/62	..	(1) US Make (2) 2/63	
12/62 9/63	Arranged by State Trading Corporation				(1) Hungarian Make (2) 6 Nos. between 3/62 & 7/62 (3) 2 Nos. 10/63	
6/63	7/63	9/63	10/63	..	(1) UK Make (2) 4/64	
1/63	4/63	10/63	11/63	..	(1) UK Make (2) 10/64	
1/65	Arranged by Chief Engineer (Const.) P.S.E.B., Patiala.				(1) Tokyo (Japan) (2) 9/66	

APPENDIX

COMMENCEMENT DATES OF VARIOUS PHASES OF

Sl. No.	Project	Date of Submission of Project Report	Date of sanction for starting Project Work	Date of Commencement of Preliminary Works
1	Trombay	12/61	27-3-62	11-8-62
2	Satpura	2-1-62	13-9-62	9/63
3	Korba	4/60	15-4-61	28-4-62
4	Neyveli	12/61	1/63	None for VI 1/64—VII
5	Kalakot	6/61	12/61	9/62
6	Tura	7/65	23-2-62	2/64
7	Chandrapura	1/60	4/58	12/59
8	Durgapur Project Ltd. . . .	6/59	1/60	..
9	Durgapur Ext. (D.V.C.) . . .	12/60	5/61	6/63
10	Delhi-C	5/61	17-9-62	3/64
11	Ramagundam	1/61	4/61	6/64
12	Obra	1/60	3/60	7/63
13	Bandel	7/60	12/60	5/62
14	Talcher	4/60	1/61	3/63
15	Dhuvaran	11/59	2/60	12/60
16	Patratu	4/61	9/62	12/61

—8

WORK IN THERMAL POWER STATIONS

Date of Commencement of Major Civil Works	Date of Commencement of Mechanical Erection	Date of Commissioning of Plant	Remarks
22-10-62	19-9-63	1-8-65	
1/64	4/64	Not commissioned	Anticipated date of commissioning 7/67
11/62	1-2-64	9/66-Unit 1	
6/63-VI 9/64-VII	9/64-VI 7/65-VII	8/65-VI Not commissioned	Do. 4/67
6-12-63	6/65	Not commissioned	Do. 12/67
12/64	Probably 4/66	Not commissioned	Do. 3/68
3/62	5/62	10/64	
8-8-61	1/62	4/64	
4/64	10/64	12/66	
3/64	10/64	Not commissioned	Do. 4/67
10/65	7/66	Not yet commissioned.	Do. 12/68
5/64	3/65	Not yet commissioned.	Do. 4/67
6/62	5/63	10/65	
11/63	6/64	Not yet commissioned.	Do. 7/67
7/61	12/62	12/65	
3/63	5/64	4/66	

APPENDIX

COMPARATIVE CHART SHOWING ACTUAL TIME REQUIRED

Sl. No.	Name of Project	Submission of Project Report to sanction for Starting Project work	Sanction for Starting Project work to start of Preliminary Civil work
1	Trombay	4 Months Commencing 12/61	4 Months Commencing 27-3-62
2	Satpura	8 Months Commencing 1/62	12 Months Commencing 9/62
3	Korba	12 Months Commencing 4/60	12 Months Commencing 15-4-61
4	Neyveli	13 Months Commencing 12/61	Unit VI—None Unit VII—12 months Commencing 1/63
5	Kalakot	6 Months Commencing 6/61	9 Months Commencing 12/61
6	Tura	Sanction of project accorded earlier than Project Report submission.	23 Months Commencing 23-2-62
7	Chandrapura	Sanction for project accorded earlier than Project Report submission.	20 Months Commencing 4/58
8	Durgapur Project Ltd.	7 Months Commencing 6/59	19 Months Commencing 1/60
9	Durgapur Ext. 3rd Unit (D.V.C.)	5 Months Commencing 12/60	25 Months Commencing 5/61
10	Delhi-C	14 Months Commencing 7/61	18 Months Commencing 17-9-62
11	Ramagundam	3 Months Commencing 1/61	38 Months Commencing 4/61
12	Obra	..	40 Months Commencing 3/60
13	Bandel	5 Months Commencing 7/60	17 Months Commencing 12/60
14	Talcher	9 Months Commencing 4/60	26 Months Commencing 1/61
15	Dhuvaran	3 Months Commencing 11/59	10 Months Commencing 2/60

FOR VARIOUS PHASES OF THERMAL POWER STATIONS

Start of preliminary Civil work to start of major Civil work	Start of major Civil work to start of Mechanical Erection of equipment	Start of Mechanical Erection of equipment to date of commissioning of plant	Remarks
3 Months Commencing 1-8-62	11 Months Commencing 22-10-62	22 Months Commencing 19-9-63	
4 Months Commencing 9/63	3 Months Commencing 1/64	39 Months Commencing 4/64	Anticipated date of commissioning 7/67.
7 Months Commencing 26-4-62	15 Months Commencing 11/62	31 Months—Unit I Commencing 2/64	
Unit VI—5 Months Unit VII—8 Months Commencing 1/64	Unit VI—15 Months Commencing 6/63 Unit VII—10 Months Commencing 9/64	Unit VI—11 Months Commencing 9/64 Unit VII—21 Months Commencing 7/65	Do. 4/67
15 Months Commencing 9/62	18 Months Commencing 12/63	30 Months Commencing 6/65	Do. 12/67
10 Months Commencing 2/64	16 Months Commencing 12/64	23 Months Commencing 4/66	Do. 3/68
27 Months Commencing 12/59	2 Months Commencing 3/62	29 Months Commencing 5/62	
19 Months Commencing 1/60	5 Months Commencing 8/61	27 Months—Unit I Commencing 1/62	
10 Months Commencing 6/63	6 Months Commencing 4/64	26 Months Commencing 10/64	
18 Months Commencing 17-9-62	7 Months Commencing 3/64	30 Months Commencing 10/64	Do. 4/67
16 Months Commencing 6/64	9 Months Commencing 10/65	29 Months Commencing 7/66	Do. 12/68
10 Months Commencing 7/65	10 Months Commencing 5/64	25 Months Commencing 3/65	Do. 4/67
18 Months Commencing 12/60	11 Months Commencing 6/62	29 Months Commencing 5/63	
8 Months Commencing 3/63	7 Months Commencing 11/63	37 Months Commencing 6/64	Do. 7/67
7 Months Commencing 12/60	17 Months Commencing 7/61	36 Months Commencing 12/62	

APPENDIX—10

SCHEDULE OF COMMENCEMENT DATES OF VARIOUS PHASES OF WORK IN HYDRO-POWER STATIONS

Sl. No.	Project	Date of submission of Project Report	Date of Sanction for starting Project work	Date of commencement of preliminary works	Date of commencement of major Civil works		Date of commencement of Mechanical/Electrical erection	Date of commissioning of plant
					Dam/Penstock	Power Station Civil Work		
1	Sharavathi I	25-10-54	6/56	3/56	1958 assumed 6/58.	3/61	5/63	1/65
2	Sharavathi II	..	..	..	1963	..	1/65	Not completed
3	Jaldhaka	30-5-60	7-5-59	1960 assumed 6/60	1960 assumed 6/60	1962 assumed 6/62	1964 assumed 6/64	Not completed
4	Bhakra Right Bank	2-5-60	25-7-61	Completed earlier.	Dam existing	1/63	7/64	5/65
5	Rana Partap Sagar	1958 assumed 6/58	1958 assumed 6/58	1961 (beginning) assumed 1/61	1/61	10/65	12/65	Not completed
6	Uhl River—Stage II	9-9-60	18-1-61	7/61	10/62	1/63	Not available	Not completed
7	Koyna I	12/52	20-2-53	1/54	11/54	3/56	9/59	5/62
8	Koyna II	7/60	18-7-62	Completed earlier.	6/64	5/63	3/64	4/66
9	Sholayar	..	28-3-59	1956/57 assumed 9/56.	2/60	9/62	5/64	5/66
10	Sabarigiri	11/57	1960/61	Not available	11/61	Not available	Not available	Not completed

APPENDIX—11

Comparative Chart Showing Actual Time Required for Various Phases of Hydro-Power Stations

Sl. No.	Project	Submission of Project Report to sanction for starting Project work	Sanction for starting Project work to start of preliminary work	Start of preliminary work to start of major civil works of Dam/Penstocks	Start of major civil works of Dam/Penstocks to start of Power Station Civil works	Start of Power Station Civil Works to Mechanical/Electrical	Mechanical/Electrical erection to date of commencement
1	Sharavathi I . . .	20 Months Commencing 25-10-54	Preliminary Works started earlier	27 Months Commencing 3/56	33 Months Commencing 6/58	26 Months Commencing 3/61	20 Months Commencing 5/63
2	Sharavathi II . . .	..	..	..	..	..	..
3	Jaldhaka	..	13 Months Commencing 5/59	13 Months Commencing 5/59	24 Months Commencing 1960	24 Months Commencing 1962	Not commissioned upto 12/66
4	Bhakra Right Bank . .	14 Months Commencing 5/60	18 Months Commencing 7/61	18 Months Commencing 7/61	18 Months Commencing 7/61	18 Months Commencing 1/63	22 Months Commencing 7/64
5	Rana Partap Sagar . .	Sanction for Project work accorded about same time of Project Report submission.	About 31 Months Commencing 1958	About 31 Months Commencing 1958	57 Months Commencing 1/61	2 Months Commencing 10/65	Not commissioned upto 12/66
6	Uhl River II . . .	5 Months Commencing 8/60	6 Months Commencing 1/61	15 Months Commencing 7/61	3 Months Commencing 10/62	..	..
7	Koyna I	2 Months Commencing 12/52	11 Months Commencing 2/53	10 Months Commencing 1/54	16 Months Commencing 11/54	42 Months Commencing 3/56	32 Months Commencing 9/59
8	Koyna II	24 Months Commencing 7/60	23 Months Commencing 7/62	23 Months Commencing 7/62	10 Months Commencing 5/63	10 Months Commencing 5/63	25 Months Commencing 3/64
9	Sholayar		Preliminary work started earlier than sanction.	41 Months Commencing 9/56	31 Months Commencing 2/60	20 Months Commencing 9/62	24 Months Commencing 5/64
10	Sabarigiri			Incomplete date			

APPENDIX—12

Time Taken for Different Erection Works In III Plan Thermal Power Station

(In months)

Sl. No.	Activity	Trombay Extn. Unit 150 MW	Korba Unit I 50 MW	Neyveli VII Unit 100 MW	Chandrapura Unit 140 MW	Chandrapura Unit II 140 MW	Durgapur (W.B.) Extn. Unit 2×75 MW	Durgapur (DVC) Extn. Unit 140 MW
1	Boiler Erection	21	18	13	27	30	21	20
2	T. G. Erection	17	19	10	11	12	17	13
3	Boiler Auxiliaries	9	17	11	6	6	20	21
4	Turb. Auxiliaries	18	15	11	7	10	28	8
5	Piping	11	17	6	11	7	16	8
6	Control & Instruments	8	6	8	7	6	11	7
7	Turb. Room Crane	..	4	..	8	..	5	..
8	Switch-Gear	8	14	9	9	9	18	9
9	Step up Station	6	18	12	5	..	18	5
10	Coal Handling System	26	22	17	14	..	12	12
11	Water Treatment Plant	8	25	..	6	..	17	16
12	Fuel Oil Plant	10	20	..	2	..	9	5
13	Power Station Cabling	12	8	12	9	15	13	9
14	Piping Insulation	11	..	..	10	16	..	..
15	Precommissioning Tests	5	..	..	2	2	3	5

Appendix 12—*contd.*

TIME TAKEN FOR MAJOR WORKS AND SUMMARY OF III PLAN THERMAL POWER PROJECTS

(In months)

Sl. No.	Activity	Trombay Extn. Unit 150 MW	Korba-I Unit 50 MW	Neyveli-VII Unit 100 MW	Chandrapura 1 Unit 140 MW	Durgapur (W.B.) Extn. Unit 75 MW	Durgapur (DVC) Extn. Unit 140 MW
1	Concrete Work for Power Stn. Bldg.	6½	..	22	28	11	25
2	Concrete Work for T.G. Foundn.	2½	..	6	6	8	5
3	Fabrication of Structures	13	..	12	12	17½	11
4	Super Structure Construction	13	..	16	12	22	14
5	Start of Fabrication to Completion of Super Structure with Dovetailing	13	..	17	16	24	18
6	Civil Works for Coal & Ash Handling System	6½	..	..	12	8	17
7	Chimney Constn.	8	..	..	..	..	13
1	Project Apptoval to Start of Civil Works	13	19	23	47	20	36
2	Start of Civil Works to start of T.G. erection	10	25	10	19	12	16
3	Start of T.G. erection to Commng.	17	19	11	11	20	14
4	Start of Civil Works to Commng.	27	44	21	30	32	30
5	Project Appvl. to Commng.	40	63	44	77	52	66

APPENDIX—13

Comparative Chart Showing Time Taken For Procurement Action, Major Civil Works and Erection

Sl. No.	Project	From submission of Project Report to Project completion —in months	From submission of Project Report to issue of important tender for equipment —in months	From submission of Project Report to Commencement Major Civil Workst —in months	From commencing major civil works to completion of Project —in months	Remarks
1	2	3	4	5	6	7
1	Trombay	44	11	11	33	
2	Satpura	66	15 (boiler)	24	42	Anticipated date of commissioning 7/67
3	Korba	77	28	31	46 1st unit	
4	Neyveli	44 VI units 64 VIII units	27 27	20 36	24 VI unit 28 VII unit	Do. 4/67
5	Kalakote	78	19	30	48	Do. 12/67
6	Tura	72	..	33	39	Do. 3/68
7	Chandrapura . . .	78	19 to 32	47	31	
8	Durgapur Project . .	58	6	26	32	
9	Durgapur Extension (DVC) .	72	8 to 21	40	32	
10	Delhi-C	69	2 to 21	32	37	Do. 4/67
11	Ramagundam . . .	95	34 (boiler)	57	38	Do. 12/68
12	Obra	87	11	52	35	Do. 4/67
13	Bandel	63	8	23	40	
14	Dhuvaran	62	6	20	42	
15	Talcher	87	32 to 52	43	44	Do. 7/67
16	Patratu	60 1st unit	17	22 1st unit	38 1st unit	

APPENDIX—18

List of Schemes Anticipated to Yield Benefits in The Fourth Plan

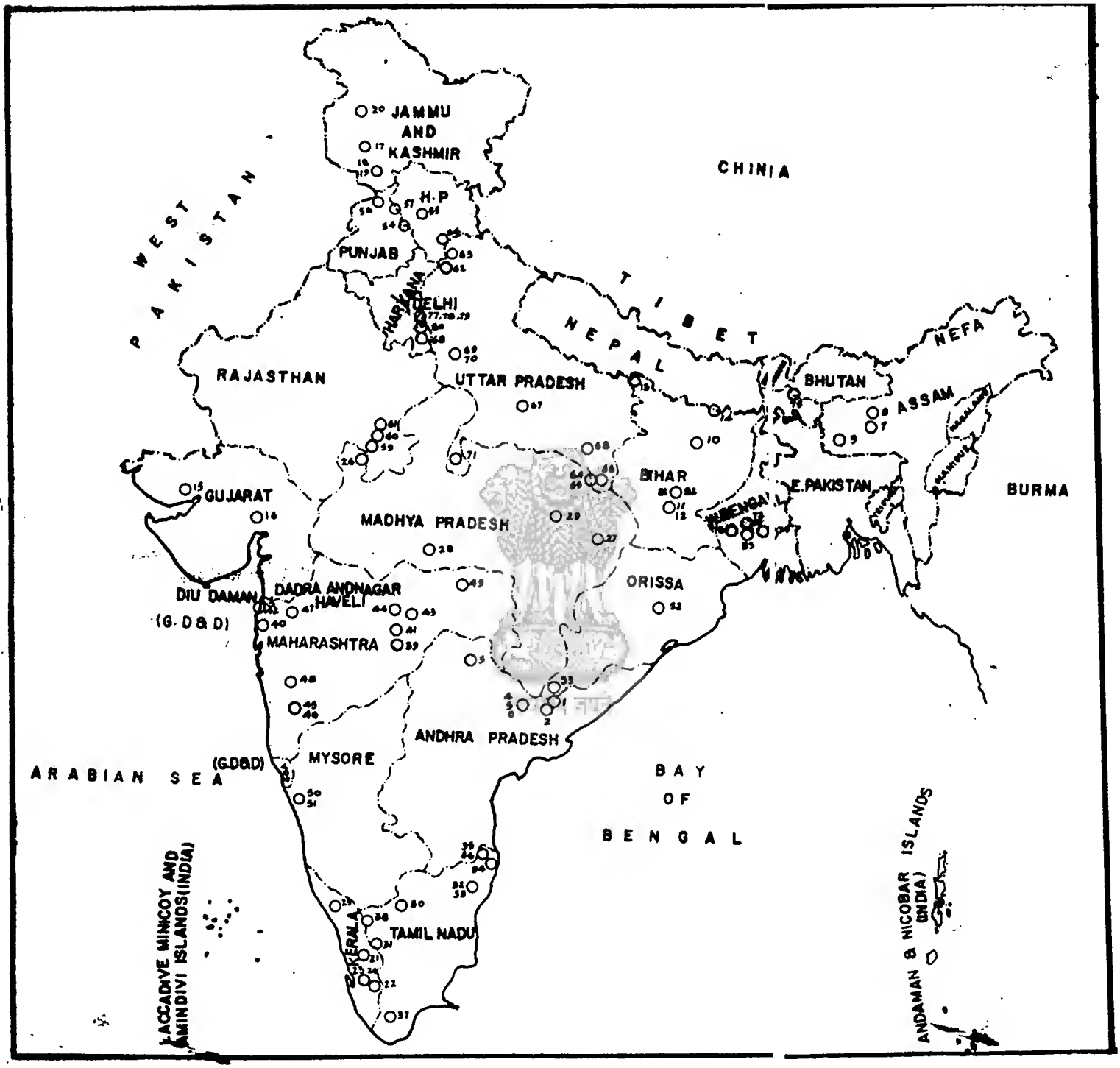
Location/Scheme	Benefits during Fourth Plan in MW
Andhra Pradesh	
Continuing Schemes :	
Upper Sileru (Hydro)	120·0
Ramagundam (Thermal)	62·5
Kothagudam—I (Thermal)	120·0
New Schemes :	
Kothagudam-II (Thermal)	120·0
Kothagudam-III (Thermal)	220·0
Lower Sileru (Hydro)	100·0
Assam	
Continuing Schemes :	
Umiam-II (Hydro)	20·8
Gauhati (Thermal)	30·0
Tura (Thermal)	5·0
Bihar	
Continuing Schemes :	
Barauni Extension (Thermal)	100·0
Patratu (Thermal)	400·0
Gandak (Hydro)	15·0
Kosi (Hydro)	20·0
New Schemes :	
Patratu extension (Thermal)	200·0
Gujarat	
Continuing Schemes :	
Kandla (Thermal)	10·0
New Schemes :	
Dhuvaran Extension (Thermal)	280·0
Jammu & Kashmir	
Continuing Schemes :	
Kalakot (Thermal)	22·5
Chenani (Hydro)	15·0
New Schemes :	
Upper Sindh (Hydro)	22·5
Chenani Extension (Hydro)	10·0
Diesels	5·0
Kerala	
Continuing Schemes :	
Sholayar (Hydro)	54·0
Pamba (Hydro)	300·0
Kuttiadi (Hydro)	75·0
Iddiki (Hydro)	130·0
New Schemes :	
Cochin (Thermal)	55·0

APPENDIX 18—*contd.*

Location/Scheme	Benefits during Fourth Plan in MW	
MADHYA PRADESH		
Continuing Schemes :		
Chambal-V (Hydro)	23·0	Share of Madhya Pradesh . 11·5 MW Share of Rajasthan . . 11·5 MW
Korba (Thermal)	200·0	Share of Madhya Pradesh . 187·5 MW
Satpura (Thermal)	312·5	Share of Rajasthan . 125·0 MW
New Scheme :		
Amarkantak (Thermal)	110·0	
MADRAS		
Continuing Schemes:		
Mettur tunnel (last unit) (Hydro)	50·0	
Parambikulam (Hydro)	185·0	
Neyveli (Thermal)	100·0	
New Schemes :		
Basin Bridge (Thermal)	30·0	
Ennore (Thermal)	330·0	
Kodayar (Hydro)	100·0	
Neyveli (Thermal)	200·0	
Ennore Extension (Thermal)	110·0	
Kunda-IV (Hydro)	110·0	
MAHARASHTRA		
Continuing Schemes :		
Koyna (Hydro) Stage II	225·0	
Vaitharna (Hydro)	60·0	
Purna (Hydro)	22·5	
Tarapore (Nuclear)	380·0	Share of Maharashtra . . 190 MW Share of Gujarat . . . 190 MW
Paras (Thermal)	62·5	
Bhusaval (Thermal)	62·5	
New Schemes :		
Purli (Thermal)	60·0	
Nasik (Thermal)	280·0	
Koyna-III (Hydro)	160·0	
Bhatgar & Vir (Hydro)	23·0	
Nagpur (Thermal)	120·0	
MYSORE		
Continuing Scheme :		
Sharavathi-II (Hydro)	534·0	
New Scheme		
Sharavathi—9th & 10th units (Hydro)	178·0	
ORISSA		
Continuing Schemes :		
Talcher (Thermal)	250·0	
Balimali (Hydro)	360·0	
PUNJAB		
Continuing Schemes :		
Bhakra Right Bank (Hydro)	480·0	Share of Punjab . . . 408 MW Share of Rajasthan . . 72 MW
Uhl (Hydro)	45·0	
UBDC (Hydro)	45·0	
Pong (Thermal)	10·0	
New Scheme :		
Faridabad	55·0	

APPENDIX 18—*contd.*

Location/Schemes	Benefits during Fourth Plan in MW	
RAJASTHAN		
Continuing Schemes :		
Rana Pratap Sagar (Hydro)	172·0	Share of Rajasthan . . 86 MW Share of Madhya Pradesh . 86 MW
Kota (Hydro)	100·0	Share of Rajasthan . . 50 MW Share of Madhya Pradesh . 50 MW
Nucleur	200·0	
UTTAR PRADESH		
Continuing Schemes :		
Yamuna-I (Hydro)	39·0	
Yamuna-II (Hydro)	60·0	
Obra (Hydro)	100·0	
Obra (Thermal)	250·0	
Kanpur (Thermal)	64·0	
Renukoot (Thermal) (Public Sector)	125·0	
New Schemes :		
Harduaganj-III (Thermal)	100·0	
Harduaganj-IV (Thermal)	110·0	
Dhukwan (Hydro)	22·5	
Obra (Thermal) Extension	200·0	
WEST BENGAL		
Continuing Schemes :		
Durgapur Coke Oven (Thermal)	75·0	
Bandel (Thermal)	82·5	
Jaldhaka (Hydro)	27·0	
New Schemes :		
Durgapur Coke Oven Extn. (Thermal)	150·0	
Santaldih (Thermal)	240·0	
DELHI		
Continuing Schemes :		
15 MW Station (Thermal)	15·0	
'C' Station Extn. (Thermal)	187·5	Share of Delhi . . 125 MW Share of Rajasthan . . 62·5 MW
New Schemes :		
'C' Station 5th Unit (Thermal)	55·0	
Badarpur (Thermal)	200·0	Share of Delhi . . 100 MW Share of Uttar Pradesh . . 100 MW
D.V.C.		
Continuing Schemes :		
Chandrapura & Durgapur Extn. (Thermal)	280·0	
New Schemes :		
Chandrapura Extn. (Thermal)	240·0	
HIMACHAL PRADESH		
New Scheme :		
Giribata (Hydro)	60·0	
	10,939·8	
Non-utilities		
Singareni Collieries	18·0	
	10,957·8	



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